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HYGIENE AND TREATMENT OF CATARRH.

THERAPEUTIC

AND

OPERATIVE MEASURES

CHRONIC CATARRHAL INFLAMMATION

OF THE

NOSE, THROAT AND EARS.

FORTY ILLUSTRATIONS.



PART II.

BY

THOS. F. RUMBOLD, M. D.

ST. LOUIS: GEO. O. RUMBOLD & CO. 1881. YAAAALIAA

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PREFACE.

The theory and practice contained in this work, is the product of over twenty years of continuous labor, observation and study.

Although I have done my utmost to indicate as plainly as possible, the proper management of every phase of this disease, giving three chapters containing the histories of the more common cases and their treatment, yet those who expect that this book will enable them to treat successfully every case, will be mistaken. The circumstances surrounding each patient are different from that of every other patient, making it necessary that each case should be studied by itself. The management of this disease cannot be learned in a short time.

Having gone entirely out of the beaten track, with respect to the method of making local applications, I may have been too regardless of long established practices. This, however, I leave to the general profession, who, after all, are the TRUE CRITICS. Their almost universal dissatisfaction with the prevailing methods, will soon lead them to ascertain for themselves, whether, what I have recommended is an improvement or merely a change.

My remarks against the employment of the Eustachian catheter may grate upon the ears of some of my brother practitioners. My reason for discontinuing its use almost entirely, is because it has been superceded by methods that are not at all irritating. It would not surprise me if Politzer's and Gruber's methods would place the Eustachian catheter in the drawer where we preserve our discarded instruments.

Should my description of the "Patency of the Eustachian Tube" not be explicit enough to ensure the consideration of this disease in works on Otology, other writers will soon supply the deficiency, as the complaint is not an uncommon one. I wish to record my opinion that the phenomena attending this disease will prove that the present views of the functions of the Eustachian tube are erronious.

I fully believe that what I have said on chronic catarrhal inflammation of the nasal passages preceding all catarrhal diseases of the respiratory tract, ears and eyes; on the liability of this inflammation giving rise to diseases in other parts of the organism that are intimately connected with the nasal cavities by nerves; on the paramount importance of hygienic measures; on the great advantage of treating all catarrhal mucous membrane with non-irritating remedies by mild methods; on the spray producer being the

only instrument that should be used to make applications to the inflamed mucous membrane; on the possibility of successfully treating the majority of laryngeal troubles by applying remedies to the pharyngonasal cavity alone; on the importance of making ocular and aural examination of the ear at the same time, by means of the Acou-otoscope; on the certainty of detecting a perforation of the membrana tympani by the tuning fork; on the advantages gained by maintaining a perforation of the membrana tympani to ensure a more thorough treatment of the Eustachian tube and the middle ear; and on the functions of the uvula, the azygos prominence, the Eustachian tube and the mastoid cells, will stand the test of close examination, and will be accepted by the profession in a few years.

If it is urged against me, that I have differed very materially from many who are recognized by the profession as being well informed on this subject, I have only to say that what has been given here, is the result of an honest search after facts, and that these facts are stated as I saw them, not fearing to question the correctness of long acknowledged theories, my only guide being my patients' reports — THIS HAS BEEN MY EDUCATOR.

It is conceded by all who have had extensive

experience in operative procedures requiring use of a large variety of instruments, that it is an important means of securing success to have every thing so arranged that the operator may have the greatest facility for making examinations, applications, etc. With this end in view I have spared no pains to make the armamentarium of my office, including my operating table, as perfect and convenient as possible. It has been my aim to simplify the methods of cleansing and of making applications, but I have not sacrificed thoroughness for simplicity, nor have I sacrificed mildness for any other quality.

The illustrations, with the exception of the section of the ear, which is taken from Henle, are original. It was not thought necessary to state under each illustrated instrument, "The author, etc.," although every one of them are of my own invention.

Many may think that I have been too prolix on some points, but now that my book is in type, I fear that I have not been as definite as the importance of many of the subjects demand.

T. F. R.

1225 Washington Avenue, January, 1881.

CONTENTS.

THERAPEUTIC AND OPERATIVE MEASURES.

CHAPTER XX.

CHAITEN AA.	
Instruments—Methods and Suggestions for Making Examinations and Applications to the Nose and Throat. Operating Table. Illumination. Anterior Nasal Mirror. The Hinged Pharyngeal Mirror. The Tongue Depressor. Uvula Retractor. Spreading Soft Palate Retractor. Curved Soft Palate Retractor. Instruments for Making Applications. The Spray Producers.	169
CHAPTER XXI.	
VIIAI IBII XXI.	
Instruments—Methods and Suggestions for Making Examinations and Applications for the Nasal and Aural Passages. Spray Producers for the Mouth of the Eustachian Tube, The Warm Spray Producer. Acou-Otoscope. Methods of Inflating the Middle Ear. Politzer's Method of Inflation. Gruber's Modification of Politzer's Method. Résumé.	203
CHAPTER XXII.	
Management of Patients. Position of the Patient and Physician. Management of Adults. Management of Children.	227
CHAPTER XXIII.	

CHAPTER XXIV.

CHRONIC	CATARRHAL	INFLA	MMATI	ON AFI	FECTI	NG '	THE	
PHAR	YNX AND LAI	RYNX.	Pares	is of th	e Sof	t Pal	ate.	
Chron	nie Follieular	Phary	ngitis.	Chron	nic In	flam	ma-	
tion o	f the Larynx.							262

CHAPTER XXV.

THE METHOD OF AIR-SUPPLY TO THE MIDDLE EAR; the	
Density of the Air in this Cavity; the Cause of the	
Uniform Concavity of the Membrana Tympani, and	
the Functions of the Eustachian Tube.	27

CHAPTER XXVI.

THE METHOD OF AIR-SUPPLY TO THE MIDDLE EAR; the
Density of the Air in this Cavity; the Cause of the
Uniform Concavity of the Membrana Tympani, and
the Functions of the Eustachian Tube. [Continued.]
Cases that Occurred in the Practice of others 9

CHAPTER XXVII.

THE METHOD OF AIR-SUPPLY TO THE MIDDLE EAR; the	
Density of the Air in this Cavity, the Cause of the	
Uniform Concavity of the Membrana Tympani, and	
the Functions of the Eustachian Tube. [Continued.]	
Experiments. The Functions of the Mastoid Cells.	
Résumé	30

CHAPTER XXVIII.

CI	HRONIC CATARRHAL INFLAMMATION OF THE EUSTACHIAN
	TUBE AND MIDDLE EAR, AND ITS SEQUENCES. Patent
	or Abnormally Open Eustachian Tube. Treatment.
	Chronic Catarrh of the Eustachian Tube and Middle
	Ear. The Tuning Fork as a Means for Diagnosing
	Perforations of the Membrana Tympani. Otorrhœa.
14	Inspissated Cerumen. Tinitus Aurium 3

CHAPTER XXIX.

CHAPTER XXX.

OPERATIVE MEASURES.—Excision of the Tonsils; Cysts of the Tonsils; Excision and Incision of the Uvula for Elongation and Œdema; Paresis of the Soft Palate; Tumors of the Uvula; Removal of Nasal and Aural Growths; Aural Polypi; Stenosis of the Nasal Passages; Nasal Abscesses; Abscesses of the Pharyngo-Nasal Cavity and the Pharynx; Calcareous Accretions in the Nasal Cavities; Stenosis of the Pharyngo-Nasal Cavity; Epistaxis; The Tubular Laryngeal Forceps; Growths in the Larynx; Perforating the Membrana Tympani for Deafness Occasioned by a Eustachian Tube that does not allow the Admittance of Sufficient Air.

CHAPTER XXXI.

REPORTS OF CASES-Patients Suffering from Diseases of the Nasal Cavities Principally; Chronic Cases that Require Treatment nearly every Fall or Spring while they Live; Patients that Wake up at Night Experiencing Sensations of Fright; A patient who had a Severe Cough, Occasioned by the Lodgment of a Foreign Body in the Nose; Four Patients who had Hay or Autumnal Catarrh: Patients whose Chief Symptoms were Pain and Fullness in the Head, Despondency, Weariness, and Irritability of Temper: Patients that had Pain in the Eyes from Reading and Studying; Patients who have Pain in the Top of the Head and in the Arms and Hands; Patients that have Vertigo and Symptoms of Epilepsy, and Complained of their Memory Becoming Defective, and their Mind Confused; Patients whose Principal Symptoms were Dyspepsia and Sleeplessness.

CONTENTS.

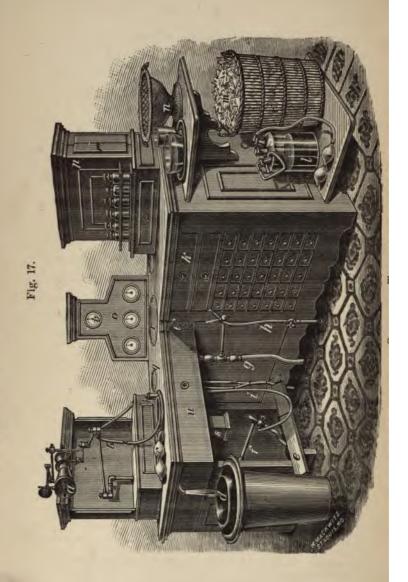
CHAPTER XXXII.

REPORTS OF CASES CONTINUED—	-Patient	s Suf	ferin,	g Mo	stly	
from Disease of the Larynx	, but ha	ve D	iseas	e of	the	
Nasal Passages also; Patie						
rassing Cough; A Patient w	ho had	Pain	in he	r Th	roat	
and Chest, and had Hemorrh	age fro	m the	e Thi	roat (and	
Lungs?)					•	437

CHAPTER XXXIII.

Reports of Cases Continued—Patie	ents Suffe:	ring M	lostly	
from Diseases of the Ears, but	have Dis	ease c	of the	
Nasal Cavities also; A Patient w	ho had C	ough	Occa-	
sioned by Disease of the Ear;	Patients	that	have	
Patency of the Eustachian Tube.				446

THERAPEUTIC AND OPERATIVE MEASURES. .



THERAPEUTIC AND OPERATIVE MEASURES.

CHAPTER XX.

INSTRUMENTS, METHODS AND SUGGESTIONS FOR MAKING EXAMINATIONS AND APPLICATIONS TO THE NOSE AND THROAT.

OPERATING TABLE,1

A table, convenient in form, which contains a sufficient number of drawers to place every instrument and remedy within easy reach, and to keep separate sets of spray producers for such patients that come regularly, and in which is arranged the necessary connections with a galvanic battery, with a reservoir

^{1.} Fig. 17 .- OPERATING TABLE. a, Tobold's Reflector; b, Soft rubber tubing that is connected with the reservoir of compressed air (b, Fig. 28); c, Double soft rubber air bulbs used to force air into the catheter nasal and aural douche, 1; d, Spittoon; e, Clamp lever for closing the rubber tube from the compressed air reservoir; f, Gas elbow that permits the bracket that holds the light to be raised or lowered; g, Water pipe seen discharging into the spittoon, d; h, Compressed air from the hydrant, used to fill the air reservoir through the tube b; i, Small rubber tube connected with the small gas burner, i; k, Two large drawers for holding instruments, the small drawers, 35 in number, below them are for holding glass spray producers for those patients who come regularly; I, Large Wolf bottle used for a catheter nasal and aural douche; m, Basket for holding soiled napkins; n, Basket for clean napkins; o, Three dials, two of which are to indicate the depth of the constant current battery zincs into the cups containing the acid, the third one indicates the depth of the zinc of the inducted battery current; p, Cabinet for holding four trays, each of which hold six bottles, one of these trays are in sight; q, Battery current reverser; r, Head of constant battery; s, Battery current interrupter; t, Rod for reversing the battery current, immediately below this is seen three rods used to raise the zincs out of the battery fluid, which are turned by a small crank; u, Large drawer; v, Meter to indicate the air pressure in the reservoir.

of condensed air, with the hydrant and with the most convenient means for illumination is absolutely essential to a successful office practice. Such a table (Fig. 17) I had constructed in 1870, after taking into consideration every want and convenience that would be required in the treatment of diseases of the Nose, Throat and Ears. As will be seen, one of its corners is cut out, givin the top an 7 shape, i. e., if we turn the letter upside down. With the physician sitting into this corner—thus placing the patient to his left -he has the table in front of him and to his right also, thus very much increasing the room for holding such instruments and remedies that will be required for the patient. It is not necessary to give a full description of the table here, as this is done in another place, by the aid of the reference letters on the illustration.

ILLUMINATION.

Slightly concentrated light from a clear sky is the best illuminator for the nasal and pharnygo-nasal cavities, the pharynx, larynx and ears; only with it, or with the electric light can the natural color be recognized. But as light of some kind is necessary in order to make every examination, application and operation, and as illumination is so frequently required at times when we cannot obtain natural light, we must fall back on artificial light, even if it does, to some degree, hide the natural color.

It is to be hoped that in a few years, at most, we will be able to light up those cavities by electricity;

as yet, this, the best illuminator; is only possible in large hospitals where a steam engine, whose aid is required to produce the light, is employed for other purposes.

I think that great advancement in the diagnosis and prognosis will likely be made when we can employ the electric light in our examinations, as with the best artificial illumination, shades of inflammation, that may be found to be the only guide to the knowledge of the case, is either obliterated or changed so that we may be kept in ignorance of the true condition of the patient.

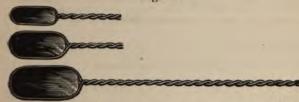
A good clean coal oil lamp, with a wick one inch wide, not older than two weeks, will produce a flame nearly two inches square. This light is to be preferred to gas light, as it is the whiter of the two. The light is concentrated and thrown into the anterior nares, mouth and ears by a concave mirror, about three inches in diameter. This reflector may be held on the forehead by a metal band that gently clasps itself over the top of the examiner's head, or it and the light may be so fitted to a bracket attached to the table that both may be lowered or raised to suit the height of the patient's head. If I treat a patient at his residence, I use the metal clasp on my head for the purpose of holding the reflector, in which case I either use natural or artificial light, as it is most convenient. In the office, I employ the artificial light almost exclusively. I do so because I find that it is better to use the kind of light that I can command at all times, as changing from natural to the artificial light is apt to confuse one as to the degree of severity of the inflammation. Dr. Tobold has arranged a series of lenses (Fig. I7, a) so that they concentrate the light on a concave mirror, which reflects the rays into the nasal, oral or aural cavities. This apparatus is almost universally employed by those who treat the upper air passages. It may be fitted on a flat-flamed gas or coal oil burner. Although the coal oil light is a better illuminator, yet because gas is more convenient, I use it exclusively in my office practice.

ANTERIOR NASAL MIRROR.

The Kramer bivalve ear speculum, is a well known and convenient instrument for dilating the anterior nasal openings. Although some appliance of this sort is requisite for the inspection of the nasal cavities, yet with this instrument but a partial examination can be made, because the peculiar formation of the turbinated processes hides from view their under surfaces. The instruments by which thorough examination can be made, are glass mirrors of various sizes. One, the pharyngeal mirror (Fig. 19), placed under and back of the velum palati and the other the Anterior Nasal Mirror (Fig. 18), passed into the nasal cavities anteriorly, during the dilation of this opening by Kramer's speculum. These mirrors illuminate the surface and reflect their image back to the observer's eye. I generally use three sizes, varying

from two to five lines in width and from five to eight lines in length. Each mirror is enclosed by a wire, placed along the edge of the glass. The extremities of the wire, by being twisted together, serve as a handle as well as a means of framing the mirror. A coat of shellac protects the amalgam back from abrasion. Any desired angle may be given to the reflectors by simply bending the wire. The length of the instruments is about five inches.

Fig. 18.



Anterior Nasal Mirrors. The mirrors are represented full size. The handle is five inches long. The desired angle may be given to each mirror by bending the wire handle near the glass.

With patients who have large nasal cavities, these may be more thoroughly and rapidly inspected by the introduction of the pharyngeal mirror (Fig. 19).

THE HINGED PHARYNGEAL MIRROR.

An experience of the inconvenience of the stationary pharyngeal mirror in making examinations of the posterior nares, the pharyngo-nasal cavity and the larynx, led me to devise the Hinged Pharyngeal Mirror (Fig. 19).

There is a pivot on the back of the frame of the mirror. On this pivot the frame holder is slipped.

The pivot allows rotation also of the reflector, so that its longer diameter may be placed in any direction desired. The frame holder is connected with a double stem by hinge joints. Any desired inclination of the reflector may by given by one of the stems being moved by a lever on the handle.

Fig. 19.



Pharyngeal mirror. By pressure on the lever on the handle the mirror may be made to take any desired angle, thus reflecting the posterior, superior and anterior surfaces of the pharyngo-nasal cavity, while rotation on its axis reflects the lateral surfaces.

The instrument is complete with one handle, and three or more reflectors of various sizes. The advantages of the hinge-mirror are: 1st, after the reflector has been introduced within the fauces, the whole surface may be seen repeatedly by reflection, without the elevation and depression of its outer extremity, which is necessary with the stationary mirror; thus avoiding one cause of agitation or disagreable impression made upon the patient's mind, which in many cases, especially with first examinations, is sufficient to excite muscular contraction of the fauces. 2d. That the survey may be more rapidly made, which is a desideratum, as the period for a pendant soft palate is often very brief. 3d. That the mirror which is slipped on the frame holder may be revolved to suit a wide or narrow fauces; and 4th. That various sized mirrors may be employed with one handle.

THE TONGUE DEPRESSOR.

A tongue depressor (Fig. 20), is required for the examination and treatment of all diseases of the posterior nares, pharyngo nasal, pharyngeal and laryngeal cavities as well as for many operations in these localities. It provides free access of light and prevents interruptions by the tongue, during the use of other instruments.





Tongue Depressor. The whole instrument is nine inches long; three tongue pieces are required, two, two and a half and three inches long respectively.

Even a slight pressure on the tongue, if made by the physician, will produce retching or contraction of the fauces and an elevation of the soft palate which will render the examination and the application of the spray totally impracticable; but if the patient has the instrument entirely under his own control, there will be no dread of being choked; the mind being at rest, there is no apprehension of any disagreeable sensations being produced by the tongue depressor, the muscles of the fauces and velum will remain quiet and passive. This is just the condition that the patient's mind and throat must be in, if a successful examination or application is to be made.

The patient is directed to place the Tongue Depressor well on the tongue, but not so far back as to cause a gagging sensation; to open the mouth as widely as possible and to breathe freely and naturally. This manner of using the depressor is not only more convenient for the physician, but very much more pleasant for the patient. The tongue depressor is in fact the patient's instrument during examination and treatment, as well as during many operations that require the opening of the mouth, such as opening abscesses of the tonsils as well as excising them, excising a portion of the uvula, removing post-velum tumors, extraction of laryngeal growths, etc.

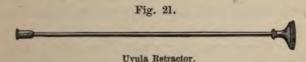
For many years I have used a tongue depressor that is nine inches long. This length places the patient's hand that holds it far enough below the chin to be out of the operator's way. Into the head of the shaft is fastened, by a milled head screw, either a long or short tongue piece (I use three sizes, two, two and a half, and three inches long), adapted to the length of the patient's jaws.

These tongue pieces may be bent to any angle with the shaft, and thus permit the base of the tongue to be depressed as much as desired in any case.

With this instrument the soft palate, the tonsils, the uvula, the lateral and posterior walls of the pharynx—as high as the first cervical vertebra, and as low as the upper border of the third—may be exposed to view, and frequently the upper border of the glottis also may be seen.

UVULA RETRACTOR.

It is sometimes necessary to raise the uvula and draw the soft palate slightly forward, in order to obtain a more extended view of the pharyngo-nasal cavity. During first examinations, the sensibility of the velum-palati is often so great that the usual hookshaped retractor, even if handled with the utmost care will almost always induce contraction of the fauces, and thus, instead of facilitating the examination, prevent any inspection of this cavity.



To avoid these disagreable effects on the part of the patient, and hindrances to the examination, I have employed a Uvula Retractor (Fig. 21), of the following description; It is a tube six inches long and one-eighth of an inch in diameter, having at one end an enlargement three-sixteenths of an inch transversely, and cup-shaped, for the reception of the uvula; the other extremity is trumpet-shaped, one inch in diameter and is covered by a single thin sheet of India rubber. Care should be taken not to use a thick sheet, nor to stretch it very tight, as the usefulness of the instrument will be lost if the suction is so strong that the patient will feel it on the uvula.

If the smaller extremity is applied gently to the uvula, whilst the air is expelled from the tube by

slight pressure (with the thumb of the hand applying it, on the rubber sheet stretched over the larger extremity,) on relaxation of the pressure, the uvula is drawn into the smaller end of the tube about onequarter of an inch.

Only slight traction is necessary to lift the uvula, draw the soft palate forward and thus increase the antero-posterior diameter of the passage from one-quarter to one-third of an inch. If carefully handled, patients generally do not feel the application of the instrument, or at least if they do feel it, they make no complaint from any sensation it produces.

SPREADING SOFT PALATE RETRACTOR.

With some patients who have but an eighth of an inch between the posterior walls of the pharynx and the uvula, the whole of the soft palate should be drawn forward to as great an extent as possible, to give every facility for applications or operations. For this purpose, a hook-shaped retractor is the only kind of an instrument that is reliable. As the patient is obliged to learn to tolerate the application of such an instrument, any form or shape that will dilate the parts and not injure them, is all that is required.

In the early part of the year 1867, I removed a large polypus from the superior wall of the pharyngonasal cavity. The greatest source of trouble during the operation was the difficulty encountered in retaining the soft palate sufficiently forward to either see

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tubing (B) slipped on over the hooks. This rubber also closes the hooks, when it is required to raise the wedge (C) on the withdrawal of the instrument from the patient's mouth. The elasticity of the arms is such as to yield sufficiently to such muscular contractions as may occur and thus prevent injury to the soft palate. The application is easy; the operator passes the hook into the mouth, while the patient depresses his tongue with the tongue depressor, requesting him at the same time to make a slight effort in phonating the sound "ing," which causes the velum to drop if it is contracted, and elevates the hooks sufficiently to engage the velum; then he separates the limbs of the instrument by pressure on the first named lever (A), which stretches the soft palate laterally; then traction on the handle increases the antero-posterior diameter of the passage. After the instrument is placed in the desired position, especially if a local application is all that is to be made, I require the patient to hold the instrument with his unemployed hand.

CURVED SOFT PALATE RETRACTOR.

During the last three years I have used successfully a soft palate retractor (Fig. 23) that is passed through one of the nostrils into the pharyngo-nasal cavity. Its inner extremity is then caused to curve downward and thus push or rather draw the velum forward. The patient can use this instrument not only to good purpose but will much prefer to do so.

This retractor will be quite convenient in all op-

erations that require the velum to be drawn forward for a long time, but especially for those who have a wide soft palate that hangs within a quarter of an inch of the posterior wall of the pharynx and in whom this organ is very flat.





Curved Soft Palate Retractor. The curved extremity is passed along the floor of one nostril until it reaches the pharyngo-nasal cavity, pressing the two ring levers a and b together causes the curved extremity to draw the velum forward, the probe point c prevents the slipping of the velum.

Compressing the two ring levers (a and b) shortens the lower bar, which is made of spring steel, and thus causes the upper jointed bar to assume the curved position; the rounded extremity (c) at the termination of the curved portion of the instruments, serves to hold the velum from slipping and to prevent pain on traction and on introduction into the nostril.

When the patient becomes very wearied, he may be allowed to relax his hold on the ring levers and, without withdrawing the instrument, may swallow as frequently as he wishes, an act that he much desires to perform, especially if he has held his mouth open for some twenty minutes.

INSTRUMENTS FOR MAKING APPLICATIONS.

On page 68 and 77, I have described the method of cleansing the nasal and pharyngo-nasal cavities. These methods may also be used for the purpose of making medicated applications. The three essential qualifications (mentioned on page 77) that the means for cleansing these cavities should possess, hold good with respect to the means for making medicated applications. These qualifications are: First, that they should make the application without causing irritation: Second, that every portion of the diseased surfaces within the nasal and pharyngo-nasal cavities, the pharynx and larynx, should be treated; Third, that all of the morbid secretion on the diseased surfaces should be removed.

Those who have had even a few years' experience in the treatment of chronic catarrh of the nasal passages and the diseases resulting therefrom, will see the necessity of carefully avoiding everything that will cause irritation. If either the means of making the application or the remedies applied, cause irritation, they should be discontinued at once. Not unfrequently the effect of a remedy would be beneficial were it not for the irritation occasioned by the rough manner of applying it, for instance with such an implement as a piece of cotton cloth wrapped around a stick, known by the euphonious name "swab."

It will require but a very little persuasion to make an observing practitioner believe that every portion

of the diseased surface of a catarrhal mucous membrane should be reached, and that those portions that are not cleansed are not benefitted by anything done to the patient; yet strange as it may appear almost every instrument or apparatus that is commonly employed by the general practitioner and by many specialists fail in this point. Not only should the diseased surfaces be freed from all morbid secretions, but it should be done in such a manner that it will not cause the least irritation. If muco-purulent secretion is allowed to remain on an inflamed and over-heated mucous membrane, it will acquire an acrid property. This quality of the secretions is the result of a kind of fermentation which the heat of the parts causes or favors. If these secretions are allowed to remain on the irritated, sensitive and inflamed surface, their acridness will aggravate the disease. Merely thoroughly but mildly removing the secretion from the nasal passages of children will almost always cure their catarrhal complaints, whether it be in the nose, throat or ears.

There is no doubt in my mind but that the relief of an emetic to a patient suffering from acute tonsillitis, is mainly owing to the thorough cleansing that the throat receives by means of the contractions of the muscles of the pharynx and pharyngo-nasal cavity in the act of vomiting.

Of the means generally used for making applications to the nasal and pharyngo-nasal cavities, the pharynx and larynx, I may mention: (a) The Gargle;

- (b) Apparatuses by which inhalations of warm or cold vapor are applied; (c) The Swab; (d) The Probang and Brush; (e) The application of Solid Substances; (f) The Syringe, by which liquids and powders are applied; and (g) The Spray Producers. Now let us examine carefully if any or all of these seven different means do or do not possess the three essential qualifications:
- (a). Gargles cannot reach the surface behind and above the soft palate. They wash the tonsils, the base of the tongue, the anterior surface of the soft palate, and but a small portion of the posterior wall of the pharynx. No reliance should be placed in gargles.
- (b). I have been very many times greatly astonished at the large number of general and special practitioners of more than the average intelligence, who, on most any other question connected with medicine, are guided by the results of their own personal observation and who would not prescribe a remedy for a pneumonia just because a professor in high authority recommended it, but would rely on their own judgment only, yet when they are called upon to prescribe for some symptom of catarrh affecting the superior portion of the respiratory tract, they not only do it without the approval of their own judgment but against their own personal observation, for not one of them has seen more than temporary relief from inhalations. They thus knowingly attempt to fill the blank of their ignorance by prescribing a

remedy only because it is recommended by an individual who claimed to have cured (?) in a few weeks a case of catarrhal inflammation by this method.

Of course both the recommender and the prescriber had forgotten that inflamed mucous surfaces are always covered by tenacious secretion, the product of inflammation, and that it is most important that this secretion should be removed. Very little observation and reflection is required to perceive that the inhalation of a vapor, either warm or cold, can to no extent cleanse these covered surfaces, except in a secondary way, that is by irritating the uncovered, the healthy surface, to the degree of exciting an unusual flow of mucus in the whole cavity, which will wash away, at least, a portion of the adhering secretion. It is evident that the surface that is covered by thick mucus is not affected by a vapor that can be borne comfortably by the patient, and, that a vapor that has strength enough, after mixture with the mucus, to affect the surface under it, is so strong that the healthy -the uncovered surface-would receive instant injury from it if the patient made more than one inhalation. A method that requires the irritation of the healthy part to free the covered surface, must do injury to the healthy surface, and the injury done to the one is much greater than the benefit to the other, for the healthy membrane will take on inflammation very much faster than the diseased portion will resume the normal condition.

Every observant practitioner knows that the more

severe the inflammation, the greater the amount and the more tenaciously does the secretion adhere to the the surface, and, that its removal is with difficulty accomplished by water thrown against it with some degree of force. Therefore, to expect that a vapor, a material as light as air, merely passing over it should remove it, is preposterous. It is thus seen that those surfaces to which the vapor is applied does not require it, and the surface that requires it does not receive it.

It seems remarkable that the habit of prescribing inhalations from a teapot of hot water containing iodine and carbolic acid should be continued for years, when only a little reflection is required to understand that it cannot perform the important office of cleansing the diseased surfaces.

The feeling of relief that is derived from the above inhalation is through the anæsthetic property of the carbolic acid. To cleanse the covered surface of the muco-purulent secretion, the irritation caused by the iodine must be greater than the anæsthetic influence of the carbolic acid. It may then be asked, why not leave the iodine out of the prescription and use the acid alone? This would be an improvement, but still it remains that inhalations cannot cleanse a catarrhal surface.²

¹ This agent should never be used of such strength as to produce the least anæsthesia, as persistent congestion always follows this effect.

² I have had three cases upon whom I performed the operation of tracheotomy in which the œdematous swelling

As inhalations do not possess the second and third qualifications, they should be discarded.

- (c). The Swab is an uncouth method of applying a remedy, and is very irritating; it cannot reach the most diseased portion of the mucous membrane, it is a barbarous instrument, and there can be no justification for its employment.
- (d). The Probang is of itself a harsh means for making applications to an inflamed mucous membrane, and this objection is sufficient to condemn it. While this objection can not be made against the Brush, yet both of these implements imperfectly apply either liquid or powers to such an extensively inflamed surface, as the pharyngo-nasal and nasal cavities, or to those parts even which they can reach. For instance, if a circumscribed spot in the pharyngo-nasal cavity or the larynx is to be touched, it cannot be done without touching other parts also, because the fauces, in its spasmodic closure, grasps the instrument and thus applies the remaining medicated liquids or powders on every portion of the presenting parts of the fauces.

If the whole surface is to be touched, this also will be incomplete, for the reason that so soon as the patient feels the contact of either the probang or brush, contraction of all the muscles of the fauces will ensue, thus completely closing the larynx. This

of the epiglottis and the aryteno-epiglottic folds was due to the use of hot water inhalations. When there is any tendency to ædema, just above or within the larynx, such inhalations are sure to increase it.

spasmodic closure will be partially relaxed only, while the patient is making expulsive efforts to eject the instrument or the medicament by retching and coughing. It is evident, under these circumstances, that it is only those parts of the mucous membrane that form the projecting folds which close the fauces, that receive the force and application from the instrument. One might as well expect to wash the palm of the hand clean by pushing a probang between the fingers and the palm when the hand is closed. In this instance, as in that of the throat, the presenting ridges only are cleansed, leaving those portions of the surface that formed the creases between the folds untouched, hence uncleansed, and those untouched spaces form at least one-half of the entire surface.

Not infrequently so much pressure is applied to the probang or brush for the purpose of passing the instrument into the larynx, or up behind the soft palate, that the presenting folds of the mucous membrane of the fauces receive positive injury. I venture the assertion that if a healthy larynx is probanged daily for one week, with a sponge and cold water only, the result will be that this healthy throat will be transformed into an inflamed one. Even if these instruments are used with such delicacy that they would cause almost no irritation, still the cleansing and the applications must necessarily be imperfect on account of the spasmodic closure of the fauces already mentioned. It seems evident that neither of these instruments possess either of the three qualifi-

cations that are indispensable in the treatment of the chronic inflammation affecting these irregular cavities.

(e). The Application of a Solid Substance to the inflamed mucous membrane of the naso-pharyngeal and nasal cavities, must, for the same reasons, be far more imperfect than is the application of the probang or brush. Even if the caustic is applied by an instrument that covers it, except at the moment the touch is made, it will be impossible for the remedy to reach the most diseased parts. Sometimes an ulcer in the pharynx or larynx or on the tonsils or on the anterior surface of the velum or the uvula may be slightly benefitted by being touched by a remedy that would be injurious to the surrounding tissues; in this case the covered caustic may be used to good purpose. However, I wish to say here that I have not used my covered caustic carrier during the last five years.

As every ulcer on the mucous membrane is molecular death, the result of complete obstruction of the circulation in the part, any application directed to the diseased spot alone does not tend to remove the producing cause, which is the congestion surrounding the ulcer. For this reason I think that it is quite questionable whether it is ever necessary to touch an ulcerated surface with a remedy that does not tend to remove the surrounding congestion. My observation teaches me that if I can succeed in relieving the irritation that produces the congestion, I always improve the appearance of the ulceration. I now treat

every ulcer by such applications to the surrounding inflamed surfaces, that the congestion is relieved at once, and at once the ulcer commences to improve in appearance. This improved appearance takes place even in those patients who afterwards die of severe disease involving the lungs. Of course constitutional treatment is also given.

(f). The Syringe may be employed to apply either a liquid or a powder. If a liquid is employed, the quantity that is necessary to cleanse the pharyngonasal cavity is so great that it will choke a young patient, nor will be submit to a second application without persuasion of some kind by his parents or physician or both. It always follows that those patients that require any persuasion to allow local treatment, are, after a time, treated as slightly as possible, which results in imperfect treatment, consequently unsuccessful treatment.

A small quantity of water will not wash a chronically inflamed surface clean. It does not have sufficient force, while the quantity that will prove efficacious is too great; besides, it is apt to go into the ethmoidal sinuses and the antra of Highmore, and there set up a new inflammation or prepare them to take on inflammation from the next cold. This is enough to condemn the instrument without taking into consideration the injury done by the curved extremity of the syringe, to the highly inflamed membrane lining the posterior wall of the larynx. While the application of a remedy in a

dry condition, by means of the syringe, might have a beneficial effect upon a cleansed surface, it could not, of itself, remove the morbid secretion; yet the removal of the secretions is fully one-half the benefit that is to be derived from the local treatment. Applying a powder upon a diseased mucous membrane, before it is cleansed, is but trifling with the patient.

As it is seen that the Syringe does not possess the three qualifications named, it ought to be discarded.

(g). There are various kinds of Spray Producers, some of which do not possess the three important qualifications; either they cause irritation, or they do not cleanse the diseased surfaces, or they do not apply the remedy to the whole of the inflamed surface. As there are quite a variety of these instruments used by the profession, I will mention the one most commonly employed. It is known as Richardson's Spray Producer. The best qualification that this instrument possesses is its strength; it being made of hard rubber, is not easily broken. It is this quality that recommends it to the purchaser-its efficiency is taken "on trust." This instrument is so constructed that the air passes out at the distal extremity of the tube and enters the bottle at the same time the air forced into the bottle presses upon the surface of the medicated solution; in this way the liquid is forced out of the same tube from which the air escapes, and is made partially into a spray.

The construction of the instrument seems to indicate that the inventor attempted to make a spray producer, but was not successful, seemingly because he did not know the proper relation of the points of the tubes to each other to make the partial vacuum which was necessary to raise the liquid out of the bottle; failing in this he turned a part of the air into the bottle and compelled the fluid to come out; thus he partially accomplished by force, what he failed to do by art.

The force of this injected liquid and spray is so great that it occasions pain. If the stream was composed of spray and air, then its force would not be so great, but as it is, a part of the stream is not made into spray; this strikes the surface with greater force than it would do were it made into a spray. The pain is also increased by the stream striking but a comparatively small portion of the surface at a time, not more than one-half inch in diameter.

With this instrument there is furnished two tips, one of which throws the stream in a horizontal direction, the other causes it to issue nearly at right angle with the tube. This tip may be slipped on the tube, so that the stream may be thrown up or down, to the right or to the left. Even if the whole of the diseased surface could be reached by these two tips, which is very far from being the case, the great force with which the stream strikes the highly inflamed and sensitive surface is sufficient to condemn the instrument.

The size of the instrument is another serious objection. It is frequently impossible to intro-

duce the curved extremity behind the velum without causing its elevation and contraction, thus completely cutting off all avenue for the application to the diseased surfaces in the pharyngo-nasal and nasal cavities; consequently the physician will fail to benefit his patient, especially if he is under treatment for affection of the throat or ears, as the nasal cavity is always the primary seat of the disease.

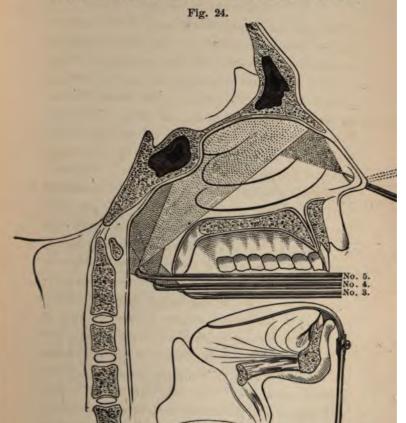
There is still another and more serious objection than either of these, which may be made against all forms of spray producers that take the medicated fluid from a bottle—viz: that the medicament cannot be applied in a warm condition. To properly treat an inflamed mucous membrane, either in the acute or chronic condition, it is essential that all the remedies applied should be warm. A remedy that will have a very soothing effect if applied while warm, will occasion positive pain if applied in a cold condition.*

^{*} I have frequently given physicians a prescription for an application for tonsillitis, informing them at the same time that it should be applied in an almost hot condition. Some of them, thinking that the temperature was of small importance, as they had been accustomed to apply all local medications in a cold state, disregarded this part of the instruction, and used it cold, the effect of which was painful rather than alleviating.

THE SPRAY PRODUCERS.

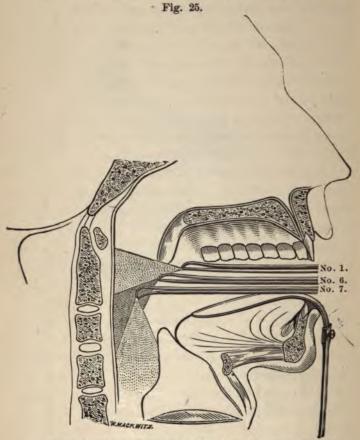
The only instruments that possess all these qualifications that are required to treat these cavities as they should be treated, are spray producers. They far surpass all other instruments for making local applications to diseased surfaces. The stream thrown by them is composed of air and fluid. As the inflamed and ulcerated surface is not touched by the instrument, but only impinged upon by the air and liquid, it follows that it is operated upon in the mildest manner possible. Consequently if the medicated fluid has of itself no irritating effect, the only cause for the contraction of the muscles of the fauces, will be the impingment of the air and spray upon the surface, which sensation the patient will soon learn to tolerate. This being the case there is abundant opportunity to make the application thorough enough to act upon the entire mucous surface, that is, to blow and wash the muco-purulent secretion away from every irregularity and from locations that are impossible to be reached by the brush or sponge, or even viewed during life. Thus these instruments combine with efficacious cleansing and medicating, a thoroughness and a mildness that is unequalled by any known means.

To accomplish these important results, each instrument must be made to throw a stream in the direction that is required to make an application to each portion of the diseased surface from the anterior nares to the trachea. The points of each instrument should be so constructed that each should throw a stream in a dif-



Antero-Posterior Section of the Head, showing the combined direction of Spray Producers No. 2, 3, 4 and 5 in the local treatment of the pharyngo-nasal and nasal cavities.

ferent direction, and their combined directions should be such that they will treat the entire surface of the cavities named (Figs. 24 and 25). They must also be of such capacity that the quantity of the liquid, and



Antero-Posterior Section of the Head. Showing the combined direction of Spray Producers 1, 6 and 7. No. 8 throws the stream on the base of the tongue. These instruments treat the pharynx, larynx and base of the tongue.

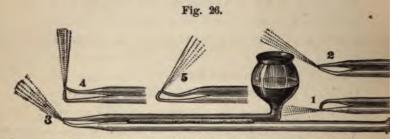
force of the air may be such as to suit the variety of

the case; that is, in the case of a child where the secretions are always fluid and the surface always sensitive, the force of the air should be just sufficient to clean the inflamed mucous membrane, and the quantity of liquid used should be comparatively small; with the patient about twenty years of age, where the secretions are in a semi-fluid condition, but very tenacious, and many times in a hardened condition, adhering so tenaciously to the surface that they cannot be removed without causing hemorrhage, the force of the air should be greater than that for the child and the quantity of fluid proportionately greater, while with the patient of forty years, in whose nasal passages the secretions are always small in quantity and the surface glazed, the spray must be composed of a large quantity of fluid and a still greater force of air than is required for either of the first classes named.

As each instrument can throw a stream in but one direction only, and as the avenue to the extensive surface of the posterior nasal and pharyngo-nasal cavities is the narrow space behind the sensitive soft palate, and to the larynx, behind the sensitive epiglottis, therefore a number of spray producers are required.

My experience has taught me that five spray producers are required to properly clean and treat the fauces, and superior cavities (Fig. 26, Nos. 1 to 5 inclusive), viz; one instrument (No. 1) that will throw a horizontal stream, while the mouth is open and the tongue depressed: it will wash the anterior

portion of the soft palate, the tonsils, and by elevation and depression of its outer extremity, the posterior wall of the pharynx from the third cervical vertebra upward to the middle of the second; another one (No. 3) that throws a stream at an elevation of 45 degrees. This spray will wash that por-



Spray Producers for making Local Applications to the Nasal and Pharyngo-Nasal Cavities, the Fauces and the Tonsils.

No. 1 treats the tonsils and the fauces; No. 2 the anterior nares; No. 3 the posterior wall of the pharyngo-nasal cavity; No. 4 its superior surface, and by slight rotation its lateral walls, and No. 5 throws the spray into the posterior nasal openings.

tion of the posterior wall of the pharyngo-nasal cavity covered by the first and second vertebræ; another one (No. 4) that throws its stream vertically, reaching the superior portion, the arched boundary of the pharyngo-nasal cavity; another one (No. 5) that treats the posterior nasal opening. This instrument throws a stream upward and forward at an angle of 45 degrees and washes the under surface, borders, edges and sides of the turbinated processes as well as the sides of the septum nasi; and still another (No. 2) that throws a stream intermediate in a direction between the first and second one named.



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To treat the larger notices the open pointers the in a many different directions. The Fig. 31, 50, 50 of these should have a seem on that posterior wall of the givery at the larger than a larger tha

as follows: In the month of June, 1866, I bought from A. M. Leslie & Co., of this city, three of Maunder's spray producers—the illustration of which was then placed by Otto and Rynders of New York in advertisement in the medical journals. One of these spray producers threw a horizontal stream, one threw a stream downward and one upward. To each of these instruments was attached a small bottle into which was placed the medicated fluid that was to be made into spray.

After using them a few days one was accidentally broken by a patient. As I could not wait for a supply from New York, and as my patient had become very much attached to this method of making applications, I resolved to try to make my own spray After a few failures I at length sucproducers. ceeded in making an instrument fully equal to the expensive one just broken, and in a few weeks afterward blew upon the end of the tube that had been inserted into the small bottle or container, a cup or reservoir such as is now seen in the illustrations on page 198. Into this cup I placed the medicated solution to be made into spray. I found that this small glass reservoir was a great improvement on the bottle, as I had even at this time learned that the fluid must be warmed before it is applied. Since that time I have made all the spray producers that I require.

For some time I thought I was the first to put a reservoir on the glass spray producer, but I find on consulting Dr. J. Solis Cohen's work on "Inhalations," first edition, that he preceded me fully one year; yet I think that he made little or no use of his invention, while I have continued to make my own spray producers and use them on from five to thirty-five patients each day since that time. For this reason I call these spray producers mine, and also claim that the method of using them as detailed in this work originated with me.

I obtain the glass tubing from the glass works, and order it made very much heavier than is ordinarily used; I also have it flattened on one side; a section of which is represented in the small figure at the left of the cup in Fig. 27. No. 6. With the tubes in this shape, they are less bulky and are more easily and firmly attached to each other. One tube is straight and five inches long. The other is three inches long with the cup or bulb blown upon it. I draw the points of each kind of tubing and bend them to their proper shape, using a small alcohol but more frequently a small gas light only; no blowpipe is needed. The tubes are bound together by fine iron wire.

As the glass tubing with the bulb can be obtained from the instrument makers, I would recommend that those who expect to use these sprays daily in their office should begin early to acquire the ability to make and repair them. At present I do not know of any metal spray producer that is equal to the glass spray producer.

I use compressed air for the purpose of making the spray. This air may be supplied by the double rubber bulbs seen attached to the catheter nasal douche and the aural douche, on pages 101 and 127? These rubber bulbs will be suitable for such patients as are treated at their residences and for physicians who expect to treat but a few cases, but for office practice a reservoir containing compressed air is essential to successful applications.

During the last five years I have employed a large air reservoir 18 inches in diameter and 8 feet long (Fig. 28.) One to four times filling—as soon as the pressure is reduced to 7 pounds to the square inch—will be sufficient to treat from ten to forty patients.

b a

Fig. 28.

a, Reservoir containing compressed air. b, soft rubber tube connected with the operating table, c, Fig. I7. The reservoir is 18 inches in diameter and 8 feet long.

Air condensed from 7 to 10 pounds to the square inch is all that is required to make good and efficient applications. Pressure much greater than 10 pounds will produce a painful and irritating sensation with most patients. This should be avoided.

CHAPTER XXI.

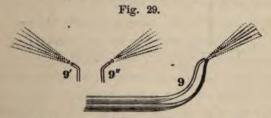
INSTRUMENTS, METHODS AND SUGGESTIONS FOR MAKING EXAMINATIONS AND APPLICATIONS FOR THE NASAL AND AURAL PASSAGES.

SPRAY PRODUCERS FOR THE MOUTH OF THE EUSTACH-IAN TUBE.

Patency of the Eustachian tube is not an unfrequent complaint, but is one that is at present not mentioned in our works on the ear.

The application of the spray thrown vertically into the pharyngo-nasal cavity and the inflation of the middle ear are very frequently unavailing in relieving the patient.

For such cases, I have employed during the last ten years, with a good degree of success, spray producers



Spray Producers for making applications to the mouth of each Eustachian Tube.

No. 9 shows the spray producer in profile; No. 9' throws a stream into the mouth of the right Eustachian tube; No. 9" into the mouth of the left Eustachian tube.

(Fig. 29) that throw their stream directly into the mouth of the affected Eustachian tube. It requires but a short time, if care is taken, to educate the velum

to allow its being drawn forward sufficiently far to allow the spray producer to be placed immediately in front of the mouth of the Eustachian tube. In this way the spray is sent directly into the canal, and if sufficient pressure of air is employed the middle ear will be inflated.

THE WARMISPRAY PRODUCER:

Warm Spray Producer (Fig. 30), which is in fact but an addition to the Siegel-Bergson steam apparatus, is a thick glass tube (d) four inches long, threefourths of an inch in diameter; this is pointed at one extremity, so as to present a half inch opening; the other is closed with a rubber cork having two perforations, one for holding the stem of a small nebulizer, that is placed within the larger tube (d) or container, and the other for the reception of the steam pipe from the boiler (a). The nebulizer and the boiler are connected with the India rubber air bulbs by a double tube (b and c) of the same material. On the arm which is connected with the boiler is a faucet (c). A small lamp is placed under the boiler to generate heat. The outer end of the container (d) is slightly elevated for the more convenient insertion into either nostril.

The mode of application is as follows: A little water is placed in the boiler (a), which is heated to about 120° F. The medicated fluid to be converted into spray is placed in the container (d); over the end of the container is slipped a common rubber nipple shield, a quarter of an inch of the closed extremity being cut off, to prevent the spray from escap-

ing, except by return from the other nostril, and to protect the patient from the heat of the glass. After the



Warm Spray Producer for Treating the Anterior Nasal Cavities and Inflating the Eustachian Tubes.

A, Boiler; B, Soft rubber tubing connected with the boiler and spray producer. C, Faucet for controlling the amount of air that is to enter the boiler. D, Large tube that contains the medicine to be made into spray. E, The spray.

introduction of the instrument into one of the nostrils, air is forced by the air-bulbs both into the nebulizer and the boiler, the effect of which is to produce a warm spray of the temperature desired. The intensity of the heat is governed by the amount of air allowed to pass into the boiler through the faucet (c). Many of my little patients prefer this instrument, both for the treatment of the nostrils, and the inflation of the middle ear. They need only to close the nostril not treated, when the warm spray will inflate both middle ears, sometimes without the act of deglutition; more frequently an involuntary act of swallowing will take place, and then the air loaded with spray is forced into the Eustachian tubes in greater quantities.

My experience, in reference to the temperature of the air forced into the middle ear, in the ears of children, is much in favor of the warm air over that of the cold.

This instrument has also proved very beneficial in myringitis, resulting from acute catarrh of the middle ear, and in furuncle. The force applied to the air bulbs for the treatment of these affections should not be as great as that required for the treatment of the nasal cavities.

ACOU-OTOSCOPE.

In the month of February, 1869, I was consulted in regard to an exceedingly troublesome noise in the patient's ear, occasioned by his own voice passing up the Eustachian tube. I had repeatedly observed the same symptom in several other patients during the previous year. By the aid of the aural auscultating tube and the peculiarity of the symptoms, I arrived at a conclusion that satisfied me with reference

to a cause of these symptoms or phenomena, but still was fearful that I might be mistaken, as the effect of this conclusion was to disprove the theories held by otologists respecting the action or function of the Eustachian tube in supplying air to the middle ear. My interest being excited, I determined to more thoroughly investigate the cause of these peculiar symptoms and in doing so, to make a more careful search into the condition of the organ or organs involved, than is usually practiced.

In ordinary examinations of the Eustachian tube and membrana tympani, the canal is auscultated at one time and the drum head inspected at another; therefore, while viewing the latter, during the inflation of the middle ear, we can only see the effects of the douche on the membrana, but no note can be taken in regard to the peculiarity of the sounds that are made by the air in its passage through the Eustachian tube, nor while listening by means of the auscultating tube to the sounds in this canal during inflation, can the effect of the air on the membrana tympani be observed; consequently during inspection of the ear, no auscultation can be practiced, nor during auscultation can there be any inspection. It was this impossibility of seeing and hearing at the same time that induced me to attempt to devise an instrument by which auscultation and inspection could be practiced together. In this I was successful and have named the instrument, as it binds two kinds of examinations, Acou-Otoscope (Fig. 31).

It consists of a truncated conical ear speculum, with its larger end closed by a well fitted piece of plain clear glass; connecting with and opening into its cavity is a metallic tube about five inches long and one-fourth inch in diameter, the purpose of which is to conduct the sounds from the patient's ear to the ears of the Aurist; it also serves for a handle by which the patient may hold the instrument in proper position.

Fig. 31.



Acou-otoscope. An instrument to enable the examiner to see the membrana tympani, and hear the effect of an inflation of the Eustachian tube at the same time.

The method of using the instrument is this: The smaller end of the conical portion is fitted into a concal ear speculum; one end of a rubber tube, about four-teen inches long, is slipped on the long metal tube, the other end of the soft rubber tube is connected with a Camman's stethoscope, the trumpet shaped extremity being removed. After placing the Acou-Otoscope in the conical ear speculum, and inserting this into the ear of the patient, he is directed to hold the instrument in the position most favorable to the Aurist for viewing the membrana tympani, using the hand corresponding to the ear inspected. He is caustioned against any movement of his fingers holding the instrument, whereby any sounds may be produced by friction, as the slightest movement thus

made will occasion sounds far louder than any that might come from his ear during examination. The Aurist now secures the reflector to his forehead, by which he illuminates the auditory canal, then places the stethoscope in his own ears, gives the patient a little water to swallow, or has him pronounce the word "hick," and while he inflates the middle ear, inspection is made through the glass of the Acou-Otoscope, so that he may observe the effects of the air douche on the membrana tympani.

In this way he is enabled to hear the sounds produced by the air in its passage through the Eustachian tube (by their being conducted from the patient's ear through the ear speculum, the Acou-Otoscope, the rubber tube, and the stethoscope, to his own ear,) and note their characteristics, and to observe the movements, or other effects, of the membrana tym pani at the same time.

In the year 1868 I read a paper on the subject of "The Function of the Eustachian Tube," etc, before the St. Louis Medical Society, and offered, in support of my views, the symptoms of several patients who were suffering from patency of the canal,—a condition not then or even now recognized by either general or special practitioners. I was aided by the aural auscultating tube, by different simple experiments and by the acou-otoscope, but only employed it as a means of supplying additional proof of patency of the Eustachian tube. I did not then recognize ts great value. Since this time I have had

occasion to treat other patients, many affected with patency of the Eustachian tube, in which I have employed it, and find from its evidence alone, that every case of this class may be correctly diagnosed, and the degree of patency ascertained, and its consequences placed upon a demonstrable basis, leaving no longer room for any reasonable doubt.

Indeed, I may say, that in all pathological conditions of the Eustachian tube, especially if the membrana tympani is also implicated, the Aurist will find that the evidence afforded him will be most full and satisfactory, enabling him to reach a conclusion that justifies but little if any doubt as to the completeness of his diagnosis. The reason for this is very plain and obvious, from the fact that the faculties of seeing and hearing are combined in the investigation, which secures a greater accuracy and certainty as to results, than was ever attained when only one faculty at a time could be used, since the recognition of a condition, either pathological or physiological, by one of the senses, may be confirmed by the operation of the other.

METHODS OF INFLATING THE MIDDLE EAR.

Forcing air through the Eustachian tube into the tympanum is a means that is very frequently used, for both the examination of the ear and for the treatment of catarrh of the tube. There are several methods by which inflation may be accomplished, but no one of them is best suited for all varieties of cases. It is taken for granted, at the start, that the method

that will accomplish the inflation in a given case and at the same time cause the least disturbance to the mucous membrane of the part operated upon is to be preferred. To be enabled to make a selection of a kind of method for a particular case, requires that an analysis of all the methods should be made. Inflation may be performed by Valsalva's method; by the Eustachian catheter, by Politzer's method and by Gruber's modification of this method.

The Valsalvian method of inflation should never be employed as a practice. It is performed by the patient closing his nostrils with his thumb and finger, and forcing air from his lungs into the pharyngonasal cavity, and out at the Eustachian tubes, into the middle ears. This method if practiced frequently, is liable to aggravate the congestion of the mucous membrane. I have seen several patients who claim that their tinnitus was caused by a continuation of this means of inflation.

The popularity of the Eustachian catheter has varied with the good or negative results following its use by those who have employed it. If the author of a book on the ear has been dextrous in its application (while it was a popular method every one claimed to use it with facility and success), he will call it an instrument that fills indications that cannot be filled by any other means. If the aurist is a young man, and especially if he has just commenced practice, he will know how to use it, and will attempt to do so, not because he prefers, but because he must

appear to the general practitioner in his neighborhood to be perfectly familiar with it. However this may be, it is certain that with the majority of aurists of experience, this instrument is reserved for those cases only in which other means of inflation that are pleasanter, have failed.

The cavities in which the extremity of the catheter operates, are the nasal and pharyngo-nasal and the mouth of the Eustachian tube. These cavities are traversed by a larger number of important nerves than any other part of the organism. Besides this, the mucous membrane here takes on a tumefied condition from apparently very slight causes, on account of the existence of the long continued chronic catarrhal inflammation that always precedes and accompanies these cases.

The tumefaction of the mouth of the Eustachian tube will have an instant effect upon the hearing, as it decreases the calibre of the tube and thus prevents the slow and continual ingress of air to the middle ear, which is essential to good hearing.

Can it be expected that a favorable result will follow the introduction of the Eustachian catheter, when it is thrust so roughly against the sensitive mucous membrane that its extremity, by its frequent propulsion and retraction (in the endeavor to place the end of the instrument within the mouth of the tube), abraids and, in some instances, penetrates the mucous membrane; or when air is injected with such great force that an emphysema of the neck results; or when it is pushed through a nasal cavity, so narrow or so irregular, that the curved extremity causes abrasion of sufficient severity to produce a hemorrhage; or, when its introduction will give rise to a swelling of the nasal mucous membrane or even an irritation that is sufficient to cause a copious flow of tears; or when its extremity is thrust into a mass of muco-purulent secretion lodged in the pharyngo-nasal cavity in the neighborhood of the Eustachian tube? It is impossible to make a favorable impression when these circumstances attend its introduction? To receive the smallest benefit its introduction must always be a painless operation, nor should mucus be blown into the Eustachian canal.

In my practice, I have restricted the employment of the catheter to patients suffering from cleft palate or from perforation of the palate, and to those very old chronic cases who require warm spray.

Fig. 32.



Soft Rubber Eustachean Catheter. The curved extremity is formed of soft rubber tubing.

Since 1871, I have employed a Eustachian catheter (Fig. 32), the curved extremity of which is flexible. With it the liability to injure the mucous membrane of the nose or of the mouth of the Eustachian tube is very much lessened. It is made of a metal tube,

of the diameter of an ordinary catheter. At one extremity is fastened a ring to indicate the position of the curved extremity; at the other extremity is fastened a piece of watch spring. At the farther end of this is soldered a small ring. Over the tube, the curved watch spring and small ring is drawn a piece of soft rubber tubing. This covers the whole instrument, makes it a non-conductor of heat and prevents the yielding curved extremity from injuring the nasal passage in its introduction. The spring portion of the catheter is easily bent to suit any desired case. Besides its being almost painless in its introduction, its flexible extremity may be made much more curved than is possible to do with a stiff catheter, and when the instrument is in its proper place, the soft rubber extremity prevents abrasion of the mouth of the Eustachian tube.

It has been my custom to direct the patient to hold the outer extremity of the catheter after it is once introduced into the mouth of the tube. I do this to prevent injuring by undue pressure of the catheter against the tube, and also to prevent the mucous membrane from closing the orifice of the catheter. I also direct them to move it slightly from place to place, for the purpose of finding the position which allows the air freely to enter into the middle ear. At first treatments patients will not hold the instrument in the right position, but it is very much better to fail several times in inflating the ear than it is to bruise the mouth of the Eustachian tube one time.

Yet even in a majority of instances the inflation of the tympanum may be done at the very first sitting.

I have another slight modification of the method of forcing air through the catheter which I think is of sufficient importance to mention. While the patient is holding the catheter in the proper position, I approach its extremity with a soft rubber tube that is connected with my Warm Spray Producer, Fig. 30, and allow the air and spray to pass into the catheter, but without touching it. Of course much of the air that is thus thrown into the catheter comes back, but I use sufficient pressure to cause full inflation. By this method, the inflation can be accomplished with the least possible injury to the mouth of the Eustachian tube.

I always spray the nasal and pharyngo-nasal cavities before inflating the middle ear. I do this to cleanse the mucous membrane, and thus prevent the possibility of blowing muco-purulent secretions from outside of the tube into the Eustachian tube or tympanum by the act of inflation.

POLITZER'S METHOD OF INFLATION.

Dr. Adam Politzer, of Vienna, deserves and no doubt receives the sincere thanks of the medical profession for his method of inflating the middle ear. It has prevented the death of hundreds and the deafness of thousands every year since its promulgation. It is almost impossible to over-estimate the benefits that have been derived from this discovery. The manner of performing this mode of inflation is to

direct the patient to swallow a little water; while the act of deglutition is taking place, the physician forces air from a soft rubber bulb (Fig. 33) into one of the

Fig. 33.



Illustrating the degree of compression of the rubber bulb to inflate the Eustachian tubes. The compression of the bulb (2 inches by 21-2) to the extent of one-half of its diameter is all that is required.

patient's nostrils, the other one being closed, and, as the avenue down the throat is shut with the soft palate, the air must enter the Eustachian tubes, and thence into the middle ears.

The nozzle of the inflator should be large enough to completely fill the nostril (Fig. 34) and the open-

Fig. 34.



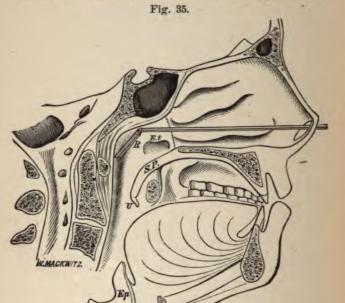
Glass Nasal tube (half size) for inflating the Eustachian Tubesthrough one of the nasal passages.

ing through it should be so large that the air may enter suddenly in a gust, and not in a continuous small stream.

If the compression of the rubber bulb be continued while the act of swallowing water is taking place, air will be forced into the tympanic cavity, not because the act of deglutition performs the office of opening the Eustachian tubes, but because this act causes certain muscles to cut off the escape of the compressed air by way of the fauces. As the closure of both nostrils prevents its escape through these passages, it must go through the two Eustachian tubes, though sometimes it passes through the lachrymal canals also.

It seems to me that this accounts sufficiently for the escape of the condensed air from the nasal cavities through the Eustachian tubes into the middle ears, but all of the works on the ear that I have examined seem to be impressed with the necessity of accounting for the entrance of the air into the middle ear by other means than by pressure, i. e., by the levator, and tensor palati muscles opening the tubes at the same instant that the act of deglutition is performed, and that this opening gives the air an opportunity to pass through to the tympanum. I am well aware that I am contradicting high authority when I assert, as I most respectfully do, that the relation of these muscles to these canals, in the healthy subject, is such that they cannot open the passage to the middle ear, and that it has never been proved that they do so. It is by no means a difficult undertaking to demonstrate that these canals are never open in the healthy subject, that is, using the word open in the sense that it is used by Toynbee, Tröltsch and Roosa. That the Eustachian tubes are always permeable to air in the healthy individual, is true, but that they are ever so

open that air may pass to and from the middle ear during the act of deglutition or any other act, I think cannot be proved. That the act of deglutition closes the mouth of each Eustachian tube may be demonstrated on individuals who have lost the septum-nasi.



Antero-posterior section of the head through nasal passages, showing the position of the mirror reflecting the upper surface of the soft palate, base of the tong e, epiglottis and vocal cords. et, Mouth of the left Eustachean tube; r, Reflector introduced through the left nostril; Sp, Soft palate; u, Uvula; Ep, Epiglottis.

This observation I have frequently made on six separate cases under my care. To make these observations, I passed a reflector (Fig. 35) through the nasal

passage, reaching to the posterior wall of the pharyngo-nasal cavity. On this reflector I directed a strong light, which illuminated the parts under observation so perfectly, that their image was reflected back to my eye distinctly. I could see the muscles acting on the mucous-membrane during the various motions of the parts, which were made by the patient at my request, to enable me to make observations. In this way I made inspections during the acts of deglutition, both of solids and fluids and of vocalization and of natural and forced respiration. During the act of deglutition, the soft palate was pushed back against the posterior wall of the pharyngo-nasal cavity by the alimentary bolus; it then ascended until its upper surface closed and covered the mouth of each Eustachian tube. This observation I made a number of years ago and recorded it in the St. Louis Medical and Surgical Journal under the head of "Functions of the Uvula." I am somewhat astonished that our eminent aurists should have failed to have made this observation. During the act of phonating the sounds that pass through the mouth alone, the soft palate was raised and a portion of its lower border was pressed against the posterior wall of the pharynx. No sound, or combination of sounds that any of the patients could make, caused the velum to rise as high as it did during the act of deglutition, and no effort on their part, but the momentary one of swallowing, closed and covered the mouth of each Eustachian tube.

These facts are within the reach of any one to demonstrate on any individual who has one large straight nasal passage. Place such a person before the window and allow the sunlight to fall into the open nostril; let him make any sound or combination of sounds, it will be seen that while so doing, he is unable to cause the velum to cover the Eustachian tubes; but request him to swallow a little saliva, then it will be seen that the velum will instantly raise and completely cover these openings.

GRUBER'S MODIFICATION OF POLITZER'S METHOD.

If it is a fact that during the act of deglutition, the velum rises high enough to cover the mouths of the Eustachian tubes, and that no sound that the patient can make will cause the velum to rise as high, we can readily see the advantage that Gruber's modification has over Politzer's. I have had a large numof patients, I believe the greater majority of them, who claim that more air passes to the middle ear during Gruber's method, than by inflation during the act of deglutition. If this is so, it is another fact which proves that the Eustachian tubes are not opened by the act of deglutition, or during that act, as asserted by every author on otology.

Gruber's modification consists in preventing the air from passing into the fauces, not by the act of deglutition as done by Politzer, but by causing the patient to pronounce a word that completely closes the passage leading from the pharyngo-nasal cavity to the fauces. The word used is "hick"

In the Monatsschrift für Ohrenheilkunde for October, 1875, we find his method detailed. He advises that the patient, whose middle ears are to be inflated, should pronounce the word "hick" in a forcible manner just as the surgeon is in the act of compressing the India rubber air bulb. The effort to pronounce this word plainly, distinctly and forcibly, causes the tongue to press the velum upward and backward against the posterior wall of the pharynx, and thus, as in the act of deglutition, cut off the communication between the pharyngo-nasal cavity and the fauces. But as before stated, the pronunciation of the word "hick" does not cause the velum to rise so high that it will close or cover the Eustachian tubes. Whereas the act of deglutition does both.

When water is swallowed, the velum closes both the tubes, and thus retains the condensed air above them, nor can the air enter the mouth of the tubes until the soft palate has descended far enough to uncover them; then the air, as it becomes rarefied by the falling velum, enters. When the word "hick" is pronounced, the mouths of both of the tubes, not being covered or closed, are ready to have the air forced into them at once, and it really enters them with more force than during the act of deglutition. There is also more time for the air to pass into the Eustachian canals, for the reason that the pronunciation of the word "hick" requires a longer time than does the act of swallowing, as it is only at the last portion of this act that inflation of the middle ear can take

place. I have noticed this fact very many times, and very frequently my patients have voluntarily stated the same thing to me.

During the first year in which I used this method (in 1876) I made frequent trials upon the same patient with the deglutition method and the phonation method. As I was anxious to ascertain the truth of this beyond a doubt, I inflated the middle ears of several patients who had perforation of the membrana tympana by means of my Warm Spray Producer (Fig. 30), an instrument which throws a steady stream of spray and warm air. The nozzle of the instrument was inserted into one nostril, the other nostril being closed by the patient. In the ear having the perforated drumhead I inserted a manometer. this I could observe, very accurately, the effect of the passage of air into the middle ear. It was quite manifest, both to the patient and myself, that the liquid in the manometer was disturbed far less during the act of deglutition than it was during the pronunciation of the word "hick." In one patient during the act of deglutition only two small bubbles of air were forced into the cup of the manometer, but while the inflation was made during the pronunciation of the word "hick," the patient retaining the tongue in such a position as to close the pharyngo-nasal cavity, very nearly all of the fluid was blown out of the cup, so great was the rush of air that passed through the Eustachian tube into the tympanum.

During these experiments the spray from the instrument was given with the same degree of force in each case. Now, it is manifest that if the Eustachian tube was opened by the act of deglutition, as contended by authors of Otology, the air should have passed through the Eustachian tube into the middle ear and out through the manometer with far greater force and demonstration than it did while pronouncing the word "hick," but the very opposite is the fact.

A very important advantage that inflation during phonation has over the inflation during deglutition, is, that the pressure on the middle ear may be continued for several seconds. This continued pressure may usually be maintained indefinitely by the use of the catheter, especially on adults, but we more frequently desire a continued pressure on the ear in a deaf child, on whom it is quite difficult to use the catheter. There is still another advantage that this method has. A child may repeat the word "hick" a half dozen times, but it cannot be able, nor is it willing to swallow as many mouthfuls of water, or at least not without considerable inconvenience to its stomach.

There are times when the middle ear of one side cannot be inflated either by Politzer's or Gruber's method without causing a painful sensation in the other ear, the one that does not require inflation. In such a case we must adopt measures that will allow air to be forced into the ear desired, and leave the other one undisturbed. This unilateral inflation is usually accomplished by the catheter, but since 1872 I have adopted a method that obviates the use of this instrument in all cases of this kind, in both old and young. It is as follows:

I direct the patient to close the auditory meatus of the ear that is desired to leave unaffected, by pressure upon the tragus with the forefinger of the hand on the same side with that of the ear to be closed. Then inflation can be performed without the least pain to the closed ear. This method of closure of the ear prevents the outward movement of the drumhead, which is the cause of the pain. The firm pressure of the finger upon the tragus condenses, to a considerable degree, the air on the external side of the membrana tympani, so that the condensed air from the Eustachian tube does not have a painful effect upon the membrane.

I have frequently observed that the hearing of my young patients is very greatly increased by the first puff of air that is forced into the middle ear. I have also observed that in those patients in whom the greatest improvement in hearing is made, are cases in which the secretions in the Eustachian tube are so abundant that in a short time the hearing will even more rapidly pass away, but if inflation is repeated in ten or fifteen minutes afterward, the hearing is again restored. I had five years ago a young patient who, for several weeks, I retained in the office for nearly two hours at each visit, making an infla-

tion once in ten minutes. The reason of this is that in young patients the secretions close the Eustachian tube, and a part of it is driven into the middle ear by the first inflation. It soon accumulates again and requires another removal. If the repeated inflations are not given, the recovery of such a case will be greatly retarded, and it is of great importance to the mucous membrane that the catarrhal inflammation should be cut short as soon as possible.

With older patients, the acute catarrh causes the flow of secretions to lodge in the Eustachian tube, which frequently, instead of closing the tube, causes it to remain too open, thus allowing too much air to enter the middle ear. This condition is denominated patentcy of the Eustachian tube. There is such a thing, then, as having the Eustachian tube too open, thus allowing too much air to pass into the ear, as well as having it too close. The closure from the mucus generally happens to the young, while the patency occurs to those of middle age.

RESUME.

Inflation by the force of the patient's own lungs, i. e., Valsalva's method, should not be recommended as a means of treatment, nor even as an experiment to be repeated, as it tends to increase the congestion of the pharyngo-nasal cavity, Eustachian tubes and middle ear. The Eustachian catheter should be restricted to such cases in which inflation or medication cannot be made by other means. The proportion of these cases to the cases that require inflation, accord-

direct the patient to swallow a little water; while the act of deglutition is taking place, the physician forces air from a soft rubber bulb (Fig. 33) into one of the

Fig. 33.



Illustrating the degree of compression of the rubber bulb to inflate the Eustachian tubes. The compression of the bulb (2 inches by 2 1-2) to the extent of one-half of its diameter is all that is required.

patient's nostrils, the other one being closed, and, as the avenue down the throat is shut with the soft palate, the air must enter the Eustachian tubes, and thence into the middle ears.

The nozzle of the inflator should be large enough to completely fill the nostril (Fig. 34) and the open-

Fig. 34.



Glass Nasal tube (half size) for inflating the Eustachian Tubes through one of the nasal passages.

ing through it should be so large that the air may enter suddenly in a gust, and not in a continuous small stream.

If the compression of the rubber bulb be continued while the act of swallowing water is taking place, air will be forced into the tympanic cavity, not because the act of deglutition performs the office of opening the Eustachian tubes, but because this act causes certain muscles to cut off the escape of the compressed air by way of the fauces. As the closure of both nostrils prevents its escape through these passages, it must go through the two Eustachian tubes, though sometimes it passes through the lachrymal canals also.

It seems to me that this accounts sufficiently for the escape of the condensed air from the nasal cavities through the Eustachian tubes into the middle ears, but all of the works on the ear that I have examined seem to be impressed with the necessity of accounting for the entrance of the air into the middle ear by other means than by pressure, i. e., by the levator, and tensor palati muscles opening the tubes at the same instant that the act of deglutition is performed, and that this opening gives the air an opportunity to pass through to the tympanum. I am well aware that I am contradicting high authority when I assert, as I most respectfully do, that the relation of these muscles to these canals, in the healthy subject, is such that they cannot open the passage to the middle ear, and that it has never been proved that they do so. It is by no means a difficult undertaking to demonstrate that these canals are never open in the healthy subject, that is, using the word open in the sense that it is used by Toynbee, Tröltsch and Roosa. That the Eustachian tubes are always permeable to air in the healthy individual, is true, but that they are ever so sician's knees between the patient's. With the patient at my left side, both he and I need but to turn slightly to the left to place us face to face. He will then be at the distance at which I can best see his throat, etc. or to make examinations, applications and operations. Should we sit directly opposite to one another, he will be compelled to assume an uncomfortable posture to enable me to see clearly into his throat. In this position the patient is compelled to sit with his feet and knees cramped by the examiner's chair and knees, or straddled by the examiner's legs. Placing the patient to my left allows me to place my table containing my instruments and remedies at my most convenient side-the right-where I can, without undue effort, reach them with my right hand. Fig. 17, page 168, represents the table that I have found most convenient, as a part of it is in front of me and part at my right side.

MANAGEMENT OF ADULTS.

The patient being in the chair, I hand him the tongue depressor, and direct him to place it well on his tongue, but not so far back as to occasion a retching sensation. While he is doing this I make the pharyngeal mirror slightly warm to prevent his breath from condensing on it, and thus dimming its reflecting surface. After holding it a moment over the light, I touch the back of the glass to my hand to ascertain whether it is either not warm enough, or is too hot. The reflector being of the desired temperature, I introduce it with my left hand, holding it

as I do a pen, thus leaving my right hand unengaged.

While the mirror is in the mouth, I rotate it, or, with the lever or the handle, alter its angle of reflection as I desire to view the different locations of the pharyngo-nasal cavity or larynx.

At the first visit of a patient, I take great care not to touch the base of the tongue, the soft palate, the uvula, the tonsils or the posterior wall of the pharynx.

I always inspect the pharyngo-nasal cavity first, the larynx next. To enable me to place the pharyngeal mirror behind the velum, I ask the the patient, after he has depressed his tongue sufficiently to allow the uvula to hang free from the base of the tongue, to breathe freely and easily. If he follows instructions, the uvula and velum will hang pendant, so that the mirror may be passed under it, which will allow a reflection of the vault above to be taken. But should the velum retract and remains high and be pressed against the posterior wall of the pharynx, I ask the patient to make a slight effort to breathe out of the nostrils; should that fail, I ask him to say "ing"; to phonate this syllable he must lower the soft palate. To see into the larynx, I direct the patient to pronounce the word "aye" distinctly, but without very great effort. In his endeavor to do so he will sound it "ah." This usually raises the epiglottis, and thus uncovers the vocal cords; very frequently a short portion of the trachea also is brought into view.

Should this effort fail, request the patient to take the depressor off his tongue for a moment, as it will be observed that he has not been breathing. For this reason he will not be in a good condition to show his throat. After this rest, direct him to again depress his tongue, to take in a full breath and say "aye" as continuously and distinctly as possible. In his endeavor to follow instruction, he may raise the base of the tongue so high that it will hide the pharyngeal mirror. Should he do this, make another start. It is best, however, not to weary a new patient by a too persistent examination.

As soon as the view is taken, the pharyngeal mirror should be withdrawn, and the patient allowed to rest a moment, as it will be observed that he has not taken a single respiration since the depressor was placed on the tongue, although he had been informed that he should breathe freely and naturally. It is always well on first examinations especially, to be careful not to cause retching or any unpleasant sensation. In this way I can educate the throat to tolerate quite freely the contact of the instrument.

It is not often that I make as perfect an examination as I desire on the first sitting of a patient, but I always see sufficient to inform the patient of his condition, of severity of the disease, and of length of time required for treatment, and to know to what part of the pharyngo-nasal cavity it is necessary to direct the strongest spray; also to know whether I require a spray that throws a large amount of air, and small quantity of liquid, or the reverse.

Great care should be taken to perfectly educate the throat, so that the after applications may be made as thoroughly as required. To educate the throat to tolerate the applications and the instruments, the patient should be reminded that he should breathe freely and naturally. The physician ought to observe whether or not the patient is breathing naturally, and so soon as respiration is not being carried on, he should again be told to breathe freely and naturally. So soon as they learn to do this while the examination or the application is being made, the velum will hang pendant and passive.

I very seldom see a patient who has been under the care of another physician, with whom I do not have trouble in making a good examination or application, for the reason that they had not yet learned the habit of breathing freely while the depressor is on the tongue. They most always retract the soft palate against the posterior wall of the pharynx, which prevents any application being made in the pharyngo-nasal cavity.

It is well not to ask the patient to lower the soft palate, or call his attention to it in any way. My observation has taught me that the greater the effort the patient makes to hold this organ in the right position, the more certainly will he hold it in a wrong position. I have several times in my life had patients hold their throat in the best possible pas-

sive position for examination and treatment, who, from some accident, were informed of the position in which they held the soft palate; from that moment on, it was impossible to get an application in the pharyngo-nasal cavity, for the reason that they endeavored to hold it forward, instead of endeavoring to allow the throat take a passive position, which they will do if they can be learned to breathe freely and naturally.

Several years ago I had a lady patient on whom I had made perfect applications for about six weeks. At one of her visits she brought a lady friend. I treated the new patient first, who then took a seat and observed me make the application on her friend. When she saw the spray coming freely out of her nostrils, she remarked that she was sorry that she could not in this way hold her throat. as she was certain that the treatment would have had a more beneficial result had she been able to do so. With this, her friend, who was being sprayed, remarked that she did not know that she held her throat at all. At the next attempt at making an application, the soft palate was raised against the posterior wall of the pharynx and no effort on her part, nor any sound that I could direct her to make, could induce the soft palate to become passive and pendant, nor did I give her a successful treatment at any time during the next three weeks, owing alone to her knowledge that she ought to allow the velum to hang loosely to permit a successful application.

There are some patients whose throats are so sensitive, that they can hardly tolerate the tongue depressor far enough back on the tongue to show the lower border of the velum. With cases of this kind, it is impossible to make a proper examination or application the first time. I am satisfied if I can make but a partial examination, nor do I inform the patient that I have been but partially successful, as at the next visit he will have learned to tolerate the presence of instruments, and also will have learned that the application is neither disagreeable nor painful.

In making applications of the spray to an adult, I generally commence with the spray throwing the vertical stream, No. 4; but if the posterior wall of the pharynx is very greatly coated, I commence with spray No. 3, as this cleanses this wall, and prevents the excessive accumulation from the posterior nares, which, when loosened, will occasion a retching sensation that must be avoided. I afterward use the spray that throws a stream into the posterior nares from behind the soft palate, No. 5.

If the tonsils are enlarged or the vocal cords reddened, then the spray that throws a horizontal stream, No. 1, can be used. It requires but slight inhalation to treat the larynx. Although I have sprays formed for throwing a stream directly downward into the larynx, I very seldom use them. When I first purchased the Maunder spray in 1866, I thought that the one that throws its stream downward was the most important, but now I know that it is the one that is least important. Even in cases of hoarseness, I do not use any other sprays than those I have named. If the anterior nares are greatly involved in the inflammation, and especially if the patient uses his handker-chief frequently, the spray that throws its stream slightly upward, No. 2, should be used.

At first visits these sprays are very seldom used as thoroughly as they should be, but after a few visits the applications can be made for any desired length of time.

MANAGEMENT OF CHILDREN.

With children the greatest care should be taken not to frighten them by the exhibition of instruments. Nearly every child, on going to the physician's office, is full of fear that some cutting operation is to be performed. Consequently he sees in every instrument an implement of torture. Of this his mind should be undeceived. It is a very common thing for a mother, as soon as she arrives in a physician's office, to which she has brought her child to be treated for catarrh, to urge vehemently upon him that he is not going to hurt, repeating it a great many times. This continuous repetition and the known reputation of physicians to actually lie to children, causes every one of them to dread going to a physician's office. The effect of this condition of the mind will of course prevent a thorough examination.

The parent should be kindly directed to take a seat at a short distance from the child, and to discontinue the reassurances of the painlessness of the applications, etc. If this is done in a mild yet firm manner it will have a better effect on the child than any statement you can make to him.

The chair in which the little patient is seated should be raised enough so that his mouth is in within view of the physician's eyes, and then in a pleasant, confident way, he should be given the tongue depressor and directed to place it on his tongue, being assured kindly and mildly that the instruments cannot hurt him nor is it possible for him to be injured by its application, as he himself has it entirely under his own control. By a little kindness combined with firmness and patience, I have nearly always made as good examinations of children from five to twelve years of age as I do of adults, and very much better than I do of doctors or their families who have had their throats "swabbed" with nitrate of silver.

In making applications to children, the spray that throws a horizontal stream, No. 1, should be used first. The pleasant taste of the glycerine and pinus canadensis will assure the little patient that there is nothing the least painful or disagreeable in the treatment. A good way to gain the confidence of a child, who is very much in dread of the application, is for the physician to spray a little of the medicine in his own mouth, but should he call the child's attention to it, the effort will appear silly and so lose its effect; nor will he gain the child's confidence should he repeatedly insist that the medicine is nice or sweet, not

bitter, etc. A very little care and kind persuasion is all that is required to induce a child to allow the first application. This, of course, is all that is needed; the child is then at once certain that the treatment is neither painful nor disagreable.

At the first four or five visits, the spray producers Nos. 1 and 2 are all that need be used; the latter is introduced into the anterior nares. After confidence is fully gained the vertical spray, No. 4, should be brought into use. As the sensation of this spray in the pharyngo-nasal cavity is a little startling, care, therefore, should be taken to allow but a slight puff of air to come from the instrument. With proper management of the patient, the seventh treatment will be as thorough as that of the adult.

CHAPTER XXIII.

CHRONIC CATARBHAL INFLAMMATION OF THE MUCOUS MEMBRANE OF THE NASAL AND PHARYNGO-NASAL CAVITIES.

I shall endeavor as concisely as possible to describe the diseases most commonly affecting the nasal and pharyngo-nasal cavities, and point out how they may be recognized and rationally treated. The importance of the subject, and the fact that few of our works contain the adequate information for a successful treatment of those complaints, is the excuse (if any were required) for endeavoring to facilitate the practice in a department of medicine so very little understood by the general profession. I am pleased to know that what has heretofore been considered as an insignificant complaint, is beginning to be appreciated by the more enlightened and intelligent portion of our profession.

Inflammation of the mucous membrane of the nasal and pharyngo-nasal cavities is probably the most frequent disease which afflicts the human body; yet less is said about the diseases of this region in our text books, than most any subject that can be mentioned. For instance, we may name skin diseases, which have called forth some of the best energies of the profession, yet for every one thus affected there are probably nine hundred and ninety-nine that are more or less affected with catarrhal inflammation of

the mucous-membrane of the nasal, pharyngeal, ethnoidal and sphenoidal cavities.

It is hard to account for this general apathy. It cannot be because there are not a sufficient number of patients; it ought not to be because it is difficult to eradicate. Certainly it is very much pleasanter to treat than diseases of the genito-urinary organs.

The question is frequently asked, what works treat of catarrhal diseases of the superior portion of the respiratory tract? It may be truly answered that almost every work on surgery and practice of medicine makes mention of the existence of this complaint, as well as give general directions for the alleviation of its symptoms, but this is given in such a desultory manner, that it throws off the confidence that the name of the author attracted.

In no cavity of the body can there be found more important nerves, nor any which have greater influence over the general welfare of the system than is found in the nasal and pharyngeal cavities, located as it is, immediately under the mental portion of the brain and having intimate connection with both the mental capacity of the individual as well as the physical functions of his organism. The trigeminus furnishes motory as well as sensory fibres, the motory from the pterygoidus internus of the third branch, the sensory from the second and third branches; the spheno-palatine ganglion also communicates with the pharyngeal branches, and with the descending palatine nerves; the otic ganglion sends branches to the

tensor palati; the uvula, according to most of authors, receives a branch from the facial; the glosso-pharyngeal, from which proceeds a great part of the sensation as well as motion of the pharynx; the pneumo-gastric sends two branches to the mucous membrane and the muscles of the pharynx. There are numerous branches connecting the spinal accessory with the pharyngeal branches of the pneumo-gastric, and branches from the pneumo-gastric unite to form a nervous plexus in the pharynx.

In what part of the human organism does a greater variety or a greater number of different and important nerves traverse it? If it is possible that pathological conditions in parts so abundantly and variously enervated only declare themselves by local symptoms, may we not expect that they will excite affections in other nerve tracts and in other organs of the body?

MENTAL SYMPTOMS.

As the chronic inflammation is located immediately under the mental portion of the brain, separated from it by a thin plate of bone, and very intimately connected by blood vessels and nerves, it might very naturally be expected that it would be more or less affected, especially if this condition has lasted from twenty to forty years.

The record of a large number of cases that I have kept, attests that in this I am correct. I have had many patients, amounting to several hundred, whose mental condition has been more or less affected by this inflammation extending from the nasal passages to the membranes of the brain.

Among the marked phenomena which this diseased condition produces, are those of uncontrollable melancholia and dissatisfaction; inability to think consecutively; to recollect the common matters of life; to add up a column of figures; to remember immediate relations' names, and some whose memory was so defective that they could not state what they had read at the top of the page after they had reached the bottom of it. In one patient, after she reached my office, she could not remember whether she came last from the eastern or the western part of the city, as she had occasion to visit both parts. Three other patients had forgotten, for a short time, their own names. In one patient the pain in the arm, of course caused by an excessive nasal catarrh of many years standing, occasioned the belief that the closure of the hand would produce rupture of the nasal blood vessels. The reason that he gave for the belief was, that so soon as he closed his hand firmly, so as to occasion some pain in it and the arm, it produced a sensation of thickening of the mucous membrane by checking the flow of blood through it. In another, he experienced the sensation, while walking, that he was sinking into the pavement up to his knees. This was so strong that frequently he was compelled to stop and raise one foot as high as his knee for the purpose of getting on top of the pavement; this he had done on several occasions.

The effect, of course, was to throw him instantly to the ground. These are but a few of the many mental phenomena that I have observed in my practice during the last eighteen years.

OBJECTIVE AND SUBJECTIVE SYMPTOMS.

The immediate objective and subjective symptoms of chronic nasal catarrh are generally not very numerous. They consist more or less of a discharge of muco-pus from the nasal passages and from the pharynx, which is generally of a purulent character. Accompanying this, there is usually more or less pain in the nasal passages or in the frontal portion of the head, or on the vertex, or in the occiput, or in the back of the neck, or on the shoulders, or in the arms. mucous membrane is frequently thickened; some of its blood vessels are large enough to be plainly visible. These symptoms may be all present in one patient at one time, or they may vary at different times and appear in different individuals. With some catarrhal patients these symptoms are so slight, that they may be overlooked; that is, they are not sufficient to indicate that they are afflicted with any disease. Instead of these local evidences of catarrh, the disease may show itself at different points, but always in nerves connected intimately with the nerves of the diseased portion of the head. For instance, the arm may become slowly affected from the facial nerve, which has connection with the fourth cervical, and this with the nerve of Wrisberg. In this way the inner portion of the left arm, the little finger and the finger next to it takes on a sleepy condition, or, as patients usually describe it, "becomes numb." In severe cases, the whole arm becomes swollen, hard and exceedingly painful.

Although I have observed these symptoms in the left arm more commonly, yet they will sometimes appear in the right arm also. According to my observation, the left side of the nose, the left ear, and the left side of the throat, is more frequently affected from this disease than the right side.

Dyspepsia is another very common symptom that accompanies this complaint, and I believe is caused by it. When we take into consideration the number of the nerves that pass through pharyngo-nasal and nasal cavities, the variety of their functions, the organs to which they are distributed, and the effect of a long continued inflammation on their peripheral extremities, it might very properly be expected that the organs to which the nerves are distributed would be ultimately diseased. This is plainly shown by symptoms that patients usually call neuralgia of the head. From the inflammation of the pharyngo-nasal cavity in the neighborhood of the basilar process, some will have a pain so severe on the top of the head, that it will cause an abscess. A young lady, sent to me by Dr. Thomas Scott, of this city, had an abscess of this description on the top of her head, that discharged nearly a tablespoonful of pus on its being opened. The only cause for it was the excessive pain in that locality, and that it was occasioned by the inflammation in the pharyngo-nasal cavity was proved by the immediate relief following a soothing application made to the inflamed surface of the nasal passages. The proof that the pain in the arms and fingers is also catarrhal in their origin, is that when the nasal passages are properly treated, the arm symptoms at once subside.

Now if this pain can be transmitted to the top of the head, the sides of the face, the arms, the fingers, the back of the neck, it certainly can have the same effect on the stomach, or it may cause a tickling sensation in the larynx, which is very often erroneously taken as an evidence of the disease in that part of the respiratory organ; and as the effect on the stomach is to produce dyspepsia, so the effect on the larynx is to produce a cough; this cough cannot be prolonged six or eight months without producing a disease in the larynx, as well as in the larger bronchial tubes, and maybe the smaller air passages of the lungs.

Following this course of reasoning, the catarrhal inflammation may, as stated, occasion a cough in the larynx, extending further down may effect the lungs, especially the nerves encircling the smaller air passages, cause them to contract spasmodically, and thus produce an asthma; or this irritation may be transmitted to the nasal passages, and show itself by symptoms known as hay catarrh, or a June or rose catarrh.

Instead of showing its effects on various portions of the respiratory tract, the disease may manifest itself by producing a palpitation of the heart. The most notable case having this symptom that I have ever seen, was that of a stranger who slowly walked into my office one morning, with his hand pressed over his left breast. He asked me for something to relieve him from severe palpitation of his heart. As I at once noted the nasal tone of his voice, and as one of my patients had informed me that he could check his palpitation by blowing his nose, I asked him if he had ever tried the effect of the use of his handkerchief in clearing his nasal passages. answered that he was afraid to do so, as he had just caused the palpitation by vigorously blowing his nose, but he had frequently taken this means to quiet a palpitation heretofore, and felt relieved by so doing, until this time. After remaining quiet for a short time the palpitation ceased.

The symptoms observed on the fingers, in the larynx, on the small air passages of the bronchial tubes, and on the heart's action, are in my opinionall the effect of one disease, namely: chronic catarrhal inflammation of the pharyngo-nasal and nasal cavities.

If I were asked, after examining a patient for the first time, whose history was unknown to me, whether his catarrh would produce a dyspepsia, or a laryngeal cough, or a tracheitis, or a bronchitis, or a paralysis agitans of the arm or of the ear, or a hay catarrh, or

pain in the top of the head, or a neuralgia of the face, I could not tell. But I do know, from the large number of cases that I have treated and closely observed, that it may produce one, two, or more of these symptons in the same individual. I believe that this same chronic inflammation of the nasal passages may affect the blood vessels of the membrane on the base of the brain, and the blood vessels of the base of the brain itself, to such an extent as to produce an altered condition of its functions, and thus really produce insanity.

To show the possibility of its affecting the mental condition, we need but to notice the close proximity of the sphenoidal and ethmoidal cavities to the brain. Is it possible that the inflammation of these cavities, separated by a thin membrane, can exist for years with out occasioning serious mental manifestation? With this view of the subject, no apology will be required for drawing attention to it more frequently than has been done in any of our works or medical journals. Our medical literature gives us very little, until lately, that is instructive upon the diseases of these cavities. With a few exceptions, that little is given so much in generalities that it is apt to mislead, rather than to impress the mind with the proper appreciation of the importance and the sequences of the pathological condition or its appropriate treatment.

It is surprising how often an intractable cough may be found to be due to a catarrhal inflammation of the pharyngo-nasal cavities; this fact should never be forgotten in the investigation of a new case. I have frequently seen patients who had a dry, tickling and very harrassing cough, who had not the adequate amount of inflammation in the pharynx, larynx, trachea or any perceptible disease of the lungs to account for it; but when a soothing spray was thrown up into the nasal space behind the soft palate, the severity of the cough was at once allayed. The continuation of this kind of local combined with constitutional treatment, always puts to rest such a cough in young patients, although it is such a cough that appears to have all the initiatory symptoms of a phthisis of the lungs.

If the examination of a chronic catarrhal patient, aged from five to fifteen years, be made by natural light, it will be observed that the color of the mucous membrane of the nasal and pharyngo-nasal cavities is a little darker red than the healthy mucous membrane covering the anterior surface of the soft palate (which nsually is healthy); the whole surface of the passages is smooth and has a glazed appearance; the quantity of the muco-purulent secretion is seldom so great as to hide the color of the membrane. The color of the mucous membrane of a patient from fifteen to thirty years of age is dark red; in a patient, who has used tobacco, the color is purplish red. In a circle of half an inch in diameter, from two to five blood vessels will be plainly visible; generally they are nearly straight in their course. The whole surface will be found to

be coated with muco-purulent secretion, but the greater amount of the secretion will be seen where the membrane forms creases, as on the under portion of the turbinated processes, and in the immediate neighborhood of the Eustachian tubes. Accumulations will also be found on the surfaces most exposed to the direct current of air made by respiration, as on the superior turbinated processes, and the posterior wall of the pharynx. In a large majority of such patients the mucous membrane will be found to be hypertrophied and roughened. In patients of thirty years of age and upward, it will be observed that the mucous membrane has a granular appearance, and in places is much hypertrophied. In a circle of half an inch in diameter there will be seen from four to eight blood vessels, and instead of their being nearly straight, as they are in the middle class, they will be very tortuous and irregular in their caliber, and from twenty to fifty times their normal diameter. With these patients, accumulations of inspissated secretion are hardly ever seen, while with the middle class such accretions are abundant, and are frequently seen in a crusted condition, but with the youngest class mentioned the incrustations are seldom seen, yet a greater flow of muco-purulent secretion is usually observable in them than in the older classes.

I account for this peculiarity of the effect of the inflammatory process on the secretion of patients of different ages in this way: With the youngest class, the blood vessels are not nearly so large as they

are in the middle class; consequently, while the blood flows with great rapidity through the inflamed parts, yet its volume is not sufficient to create the heat required to cause evaporation of the fluid portion of the muco-purulent secretion to the extent of producing inspissation. With the middle class, all conditions favorable to rapid inspissation are present; the blood vessels are large, the blood supply nearly in proportion, so that in these patients the inflammatory process has assumed such a degree of activity that the heat drives off the liquid portion of the secretion, leaving it in a more or less thick or dry condition. With the oldest class, while the most of the blood vessels have become much larger than those of the middle class, the flow of blood through them is very much slower, as is evidenced by the tortuous position the vessels are compelled to assume. My observations have led me to believe that a vessel may be enlarged to a certain extent, and still allow a large (but not proportionately as large) an increase of the flow of the blood through it, but so soon as it passes, in its progress of enlargement, a certain boundary (at present unknown to me), it rapidly loses its power to propel its contents; consequently, a larger amount of blood is driven into it from adjacent normal vessels than there is that leaves it, thus still further enlarging it, and causing it to become more tortuous. The effect of the diminution of the flow of blood is to lower the temperature. Accompanying this condition of the mucous membrane is a certain amount of local anæsthesia, another

evidence of lowering of the normal temperature. With the youngest class named, the subjective symptoms are seldom very painful. The obtuseness of their hearing, the difficulty in respiration through the nose, on account of the thickening of the nasal mucous membrane; the flow of secretions from the anterior nares, and the changed voice, caused by enlarged tonsils and partially closed nasal passages, are about all that is observable. The middle class usually have recurring pains in the upper portion of the nose and the top of the head, the back of the neck, the shoulders and arms, and a difficulty of clearing the secretions from the head and throat in the morning; these are their most common symptoms. subjective symptoms of the oldest class are usually less painful than those of the middle class, but in their place we have exhibitions of several mental phenomena that are almost never seen in the youngest class, and but seldom observed in the middle class. Named in the order in which I have observed their frequency, they are: Unusual forgetfulness, irritability and despondency; unaccountable fear or dread that something terrible is about to happen; inability to think consecutively; paralysis agitans of the muscles of the arm, the neck, the ear,* etc.; fear of mental derangement; and lastly, mental derangement itself. These symptoms do not always affect this class alone; some of them may be observed in the second

^{*} Tinnitus aurium is but a paralysis agitans of the laxator or tensor of tympani or of the stapedius muscles.

class, and some that are usually observed in the second, may be seen in the first class.

Of course no effort has been made to give the total symptomatology of catarrh, but those symptoms only that are common with each class, and that will be sufficient to elucidate one most important fact, viz: that the changes that are made by a long continued inflammation, are too great and permanent to be eradicated in a few weeks, or a few months' treatment, or even in a few years, and in some cases not even during their life.

TREATMENT: LOCAL APPLICATIONS.

The first thing to be done to either of these classes of patients, when they have so large a quantity of secretion on the mucous membrane that it hides its color, is the employment of a weak solution of carbolic acid, and glycerine, made in warm water, to cleanse the whole surface.

B .	Carbolic acidgr. ‡
	Glycerine
	Water

This should be thrown into the cavities by means of the spray producers Nos. 4, 5 and 2 (Fig. 24, page 195); the first throws a vertical stream acting on the pharyngo-nasal cavity; the second throws its stream into the posterior nares, and the third one throws its stream into the anterior nares. Should the fauces and the posterior wall of the pharynx be coated with muco-purulent secretion, these also ought to be cleansed by the spray producer No. 3.

If these spray producers have not sufficient force to properly cleanse the parts, then the catheter nasal douche, Fig. 5, page 101, should be employed, as it is essential to successful treatment of the patient, that all of the catarrhal surfaces within reach should be made *clean* before the remedy is applied.

After the cleansing is completed, vaseline and the pinus comp. should be applied by means of such spray producers as will make direct application to the whole of the diseased surface. The quantity of the vaseline that should be used with each spray producer is about one-half dram; to this, after it has been melted in the bowl of the spray producers, is added from two to five drops of the pinus canadensis mixture. This mixture consists of the following:

PINUS CANADENSIS COMP.

B.	Pinus canadensisgrs. xv.
	Glycerinæ (Price's) 3 ss.
	Acidi Carbolicigrs. ss.
	Aquæ fervens
M	F Sol

Usually I spray vaseline alone into the anterior nares. In this way the entire diseased surface going from the most forward portion of the nasal passages back to the posterior wall of the pharyngo-nasal cavity, as illustrated on page 195, is thoroughly but mildly treated. This should be repeated every day for from three to five days; then every other day for three or four weeks; then two times a week for the same length of time and once a week for the same period.

Care should be taken that the whole spray producer be made warm, almost hot, by placing it over a gas or coal oil lamp before the vaseline is placed into the bowl. If this is not done the vaseline will not flow into the tubular portion of the instrument, consequently no spray will issue on passing compressed air through it. Even should a fluid medication be applied, one that would flow while cold, this temperature will produce an injurious effect, as the inflamed surface demands warmth as well as medication. The patient should feel the warmth of every application.

The effect of these applications will be to mitigate, immediately, many of the prominent subjective symptoms. It is a very common occurrence for my patients to voluntarily state, immediately after application, that they feel relieved in the nasal passages and in the throat, and that respiration is carried on with less difficulty and more satisfaction. Should the secretion in the nasal passages be profuse, the patient should be requested to cleanse the cavities each morning by snuffing from the palm of the hand, or from a small sponge, as recommended on page 68.

At the second visit, the patient will usually announce that the secretions came away from the throat and nasal passages more freely than formerly; that he does not have as much headache, nor does he have the morning sickness that he usually experienced while clearing the throat. At the third or fourth visit the patient will report a continued improvement in

all of the prominent subjective symptoms, especially the subsidence of pain, should it be one of the symptoms.

On examination of the patient at this period, the only alteration that will be observable, is that the secretion on the surface of the nasal and pharyngonasal cavities will be but a little less in quantity than it was at the first visit; the blood vessels will be more plainly visible because there is a thinner coat of muco-purulent secretion covering them. After five or six treatments, the purulent character of the secretion usually disappears, and with most of the patients, the amount of mucus will be much lessened.

Upon inspection of the throat at about the tenth visit, the membrane will be found to be less swollen and not so dark red; the blood vessels may not be materially lessened in size, but they will be more plainly visible; all of the symptoms, objective as well as subjective, will be materially lessened.

The question may be asked: As the patient has reported himself in an improved condition, the prominent symptoms having nearly all disappeared, what evidence does the inspection of these parts afford, that there is an improvement? The answer is this: The muco-purulent secretion on every chronically inflamed mucous membrane adheres tenaciously; the surface seems to lack the ability to throw it off; for instance, if the inflammation is not decreasing, the muco-purulent secretion will adhere so tenaciously that it cannot be removed except by the aid of a brush, and

even with this means it will not be done without some difficulty; but if the patient is improving, the secrections will flow off easily, and the surface will be nearly clean.

After the fifteenth treatment, usually the mucus is not visible, although it certainly is secreted. The reason of this is, that the mucous membrane has regained so much of its normal activity or tonicity, that it sheds off any redundancy of mucus. In this condition of the membrane, the secretion does not adhere to the surface, nor indeed do I think that it could be made to adhere to it, even by the aid of a brush, which is quite a contrast to that observed at the first inspection when it could not be removed even with the aid of a brush. The degree of facility with which the mucus can be removed, and the degree of tenacity with which it adheres, is a good indication of the stage of the inflammation, and also the degree of improvement in the case.

The number of treatments required by the youngest class, who have catarrh of medium severity, varies with different individuals. A greater number is required by the light haired and light complexioned than by those of dark complexion.

Even after this course of treatment, the patient, if the catarrhal inflammation has been of medium severity, will be liable to take cold on the next change of the season, be it either fall or spring, but usually a very few treatments will have the effect, in combination with the proper constitutional treatment, of driving away the cold and relieving the recurring catarrhal symptoms. The patient will then go on gradually improving, as he did before he had taken the cold. These fall and spring treatments will have to be repeated from three to five years with the youngest and middle classes, with the oldest class they will have to be repeated fall and spring, or fall or spring, during their lifetime. They should receive these few treatments once, or at most, twice a week, from two to six weeks. Each fall and spring treatments will have the same beneficial effects, on the youngest and middle classes, that the first long course had in further reducing the size of the blood vessels and the hypertrophy of the membrane.

If we should examine a patient, under thiry years of age, even at the end of the third year of treatment, we will find that the blood vessels, although very greatly reduced in size, are still plainly visible. The question may be asked: Is this case cured, even if the patient reports to have had no catarrhal symptoms during the two years past, except at the change of the seasons? A negative answer must be given. The patient will not have entirely recovered, until all of the blood vessels will have been so reduced in size that they will not be visible to the unaided eye. Four or five neglected colds at succeeding changes of the season, for two or three years, is all that is required to bring about the first chronic condition. But if the patient, as already stated, is treated locally and constitutionally at these changes of the seasons, and

thus prevent the colds from again enlarging the blood vessels, i. e., from again bringing on chronic catarrhal inflammation, the improvement will continue until it will have assumed so permanent a character, that the patient may pass over one or two or more seasons without incurring a cold or requiring a treatment. A case of chronic catarrh may be considered cured when the blood vessels of the part have assumed the condition that they are in in the healthy mucous membrane. From this it may be surmised that I, at least, have but few catarrhal patients over thirty years of age that have recovered entirely, yet I do lay claim to having a large number who, with the fall and spring treatments, are enjoying entire immunity of all catarrhal symptoms. It is seen that according to my views, patients over thirty will require to be treated fall and spring during their lifetime, while those from ten to thirty years of age will require treatment, fall and spring, from three to five years. Children under ten may require only one or two years treatment at most.

Of course the local treatment must be assisted by constitutional treatment. I always give a prescription that combines a tonic, a diuretic and a laxative.

OZÆNA.

When the catarrhal secretions are offensive, it is due to thier retention in the various parts of the nasal cavities, or the sinuses connected with them, a sufficient length of time to become decomposed, or it is due Generally the caries of the nasal bones occurs in syphilitic patients only.

In the treatment of the first variety of these feetid catarrhs, it is absolutely essential to have every particle of the accumulated secretion removed. If the secretion is but partially removed, the next outflow of muco-pus quickly takes on the same decomposition, which not only keeps up the same disagreeable odor, but its acrid quality increases the irritation, and in this way help to maintain the disease. The removal should not only be accomplished without causing the least pain, but should be followed by a sensation of relief. For this removal the catheter nasal douche (Fig. 5, page 101,) should be employed, but so soon as the secretions can be removed by the inhalation of warm salt water from the sponge or the hand, as described on page 68, this method should be substituted.

After the cleansing, the spray producers Nos. 3, 4 and 5 should be used as named, spraying one-half dram of vaseline with about three drops of the pinus canadensis mixture in each instrument. The anterior nares should be sprayed with No. 2, using a half-dram of vaseline alone.

These medicaments are placed in the bowl of the instrument and mixed together by allowing a small quantity of air to pass through the spray producer, while the finger of the left hand is placed gently on the point when the spray comes out. The slight

pressure on the point turns a part of the air into the upper glass tube, which causes air bubbles to appear in the bowl. The rising bubbles cause the two kinds of liquids to mix. Another method is to allow the full force of air to pass through the spray producer for an instant, which is long enough to cause the fluids in the bowl to pass quickly toward the spray points. This divides the liquids, because of their different densities, into minute globules, in which condition, if well warmed, they should be sprayed into the patient's mouth and nasal cavities.

In syphilitic cases the carious bone should be removed as quickly as can be done without injury to the healthy bone.

The only method of preventing the further decay of bone is to reduce the congestion—which cuts off the blood supply to the periosteum—as soon as possible, and by sufficiently repeated applications keep the inflammation down.

Iodide of potassium, given in doses of from 5 to 30 grains, three times a day, and a four-week visit to the Hot Springs of Arkansas, will do more to alleviate a syphilitic ozena that has caries of the bones than all other therapeutic measures.

INFLAMMATION AND ABSCESS OF THE FRONTAL SINUS.

I have had but few patients who where afflicted with non-sypihlitic abscess of the frontal sinus, but a very large number who have complained of excessive pain in this region.

The treatment for both the inflammation and the abscess, (except in syphilitic patients) is to use the spray producer No. 5 with a continuous air pressure of not less than 10 pounds to the square inch. Of course the entire surface of the nasal and pharyngo-nasal cavities should be treated also, but the No. 5, using with it about two or three drams of the vaseline and pinus comp., is the only instrument that strikes in the immediate neighborhood of the openings from the frontal and ethmoidal sinuses.

As the closure of the openings is mainly the cause of the pain, and the accumulation of the muco-purulent secretion in the sinus the sole cause of the formation of the abscess, the site of the opening should receive the greatest amount of spray. I have not yet had to resort to the trephine to make an exit for the pus; it always escapes through its natural openings, commencing almost immediately after the first treatment. The application of the tinctures of iodine to the eyebrows is not only of no benefit, but always proves an additional source of pain and annoyance to the patient.

In syphilitic cases the same course should be persued. When the bones are implicated, these require removal, if possible. I recommend all of my syphilitic patients to visit and remain at the Hot Springs of Arkansas for about six weeks, and to repeat this visit once a year for four or five years. I am led to make this recommendation because of the off-repeated beneficial effect every patient who has visited these Springs has experienced, as well as from information given to me by Drs. J. M. Keller and Drake McDowell, of that place.

The fever accompanying inflammation and abscess of the frontal sinus should be treated on general principles. I am fond of prescribing tr. of aconite root for every inflammatory fever caused by disease of any portion of the respiratory organs. Usually the system is somewhat deranged, and will require a tonic, a laxative and a diuretic.

INFLAMMATION AND ABSCESS OF THE ANTRUM OF HIGHMORE.

Inflammation of the sinus may result from an extension of a nasal catarrh, or from the irritation attending the decay of a fang of an upper molar tooth. If the inflammation is excessive the opening into the nasal cavity will become occluded, which will greatly increase the trouble and result in the filling of the cavity, so that it will resemble an abscess.

The first indication of the formation of pus in the antrum is a dull, heavy pain in the cheek. This is soon followed by a throbbing sensation. With the opening of the occluded passage from the nasal cavity to the antrum the pain ceases almost immediately. This passage is opened by means of the spray-producer No. 5, using an air pressure of ten pounds to the square inch, and spraying about two or three drams of vaseline, mixed with the usual proportion of the pinus canad. comp. The spray producer introduced into the anterior nares will be of some benefit, but the No. 5 is the instrument to be depended upon.

If the irritation comes from a carious tooth, this should be extracted; then for a short time the antrum may be cleaned through this opening. Strange as it may appear, I have observed that after the thick purulent secretion is removed through the opening made by the tooth, the inflammation will be most successfully treated through the posterior nares.

These cases are usually tedious and are always preceded by a long standing nasal catarrh, which of course must also be successfully treated, locally and constitutionally, to result in a successful issue of the the diseased antrum.

CHAPTER XXIV.

CHRONIC CATARRHAL INFLAMMATION AFFECTING THE PHARYNX AND LARYNX.

PARESIS OF THE SOFT PALATE.

This is by no means an uncommon affection. It is occasioned by long continued and excessive inflammation of the pharyngo-nasal cavity. As the inflammation of this cavity is reduced, so also does the disability of the velum disappear. The effect of the paresis is mostly observable in the liability of fluid to pass up into the pharyngo-nasal cavity during the act of deglutition. Sometimes solids, also, are allowed to pass up into this space. Patients thus affected find great difficulty in pronouncing the word "hick" with sufficient power to allow an inflation of the ear. No special treatment is required for this disability, as it is usually relieved by the treatment of the nasal and pharyngo-nasal cavities.

CHRONIC FOLLICULAR PHARYNGITIS.

To the ease with which these growths may be seen by every physician who inspects the throat, may probably be ascribed the frequency that they are attacked by various kinds of caustics, astringents, cauteries, forceps and knives. These follicles are so harmless that they should be untouched, especially as everything done that will remove them will injure the throat. This is evident when it is known that they are but sequences of chronic nasopharyngeal inflammation, and when this inflammation is reduced the follicles disappear also.

In fact, the treatment of the excoriation, on the side of a child's head, that is occasioned by a discharge from the ear, will be as beneficial to the child's otorrhea, as will be the treatment of a follicular pharyngitis in relieving a patient of the cause that originated the follicles.

CHRONIC INFLAMMATION OF THE LARYNX.

The prominent symptom of this complaint, that is usually given by patients, is that of tickling in the neighborhood of the vocal cords, soon followed by a sensation of an adhering tenacious secretion.

About this stage of the complaint, involuntarily and without knowing the reason for his doing so, the patient will, after he has placed the soft palate against the posterior wall of the pharynx, forcibly draw air through the nostrils, thus bring down a part at least of the accumulated secretion from the pharyngo-nasal cavity into the pharynx, and from there hawk it up. The relief following this effort will be just in proportion to the quantity removed from the cavity. Frequently the effort to draw the secretion down from behind the velum will be unsuccessful; then the irritation caused by the accumulated secretion will be sufficient to call for aid from the pneumogastric nerve, which sends branches to the mucous membrane and muscles of this cavity. This nerve will cause contraction of the superior constrictors, as well as cause an increased outflow of fresh mucus, which may, and does in the majority of instances, remove the offending matter; but, the superior constrictors cannot act alone, for the reason that the nerve that causes them to contract also produces marked effects upon the stomach, resulting in efforts at retching and sometimes actual vomiting. This sickness of the stomach is usually very disagreeable to the patient, and, together with the frequent coughing, causes pain and distress in the chest, which in turn fills him with anxiety from fear that he has some serious lung trouble.

If the secretion in the pharyngo-nasal cavity is not removed the patient will continue to cough, but for several days he will not raise the least secretion from the larynx. After he has continued this coughing and hawking, the exertion of the larynx will, in a few weeks, cause sufficient irritation to give rise to the flow of a tough, frothy mucus of a whitish color, the irritation not being yet long enough in duration to occasion an outflow of muco-pus. It is not an uncommon occurrence for patients to expectorate a jelly-like, dirty colored sputa, which frequently comes out of the mouth before they anticipate it. The coloring matter of this expectoration is not blood or any of its constituents, as supposed by some authorities, but is merely soot and dust inhaled during the day. This is easily proved by microscopic examination.

After a time, hoarseness supervenes, then the dis-

charge becomes more copious. If the the patient has been using one of the many steam spray producers, found in our instrument stores, the expectoration, hoarseness, etc., will soon be greatly increased. Not unfrequently I have observed, after such a course of treatment, streaks of blood in the muco-purulent secretion coughed up; when this is the case, the pain, the chest symptoms, and the anxiety of the patient will be greatly increased.

The voice sometimes becomes affected, and takes on a hoarse or husky tone, especially after speaking or reading twenty or thirty minutes. If the speaking is persisted in, the pain or rather the weariness becomes excessive, so much so that to even listen to reading or speaking by another person is wearisome.

The voice cannot at all times be taken as a guide to the amount of disease in the larynx, as there are many patients who are hoarse at the commencement of a speech, but soon lose this symptom as they proceed.

Frequently, preceding and accompanying these symptoms, are manifestations of more or less disturbance of the nervous system, shown by a tendency to remain awake, should even a slight cause disturb sleep. Then the sensation of dryness in the throat, occasioned by the patient being compelled to breathe through the mouth—the nasal passages filling so soon as the recumbent position is assumed—is particularly noticeable, which is relieved by attempts at expectoration.

Sometimes the patient is awakened by a suffocative sensation. This may be but sufficient only to disturb sleep, or it may be so severe that he will jump out of bed and grasp at any object to support himself, until he gets his breath. Recurrences of these spasms usually take place at such times, each fall and spring, or each fall or spring that he has "taken a cold in the head," but they will not recur except on his taking colds that affect the nasal passages.

This is the condition of the patient when he consults his physician. He desires relief for his throat, lung and head symptoms as soon as possible.

Observations, made during the last fifteen years, have taught me that the inflammation that causes the tickling and sensation of mucus in the larynx, is really in the pharyngo-nasal cavity and not in the larynx. This can be proved by both inspection and treatment of the parts. The pharyngeal mirror will show but little inflammation in the larynx, and no mucus, but if the reflector is turned toward the pharyngo-nasal cavity, there excessive inflammation will be seen to exist, and also a large accumulation of tough, adhering muco-purulent secretion. Now, if this secretion is removed by mild means, and a soothing application be made to the irritated and inflamed surface, the symptoms in the larynx will at once subside, to be again experienced only on its re-accumulation. Another evidence that I am right in this, is that four-fifths of the patients on whom the spray

from the spray producer No. 41 is applied, at once voluntarily say, "that (meaning the spray) went right straight to the sore place in my throat," although not a drop was sent or went into the throat, but all of it going in the opposite direction, i. e., up from the throat into the pharyngo-nasal cavity. Again, should a spray from the spray producer No. 72 be thrown down into the larynx only little or no relief will follow its application.

Hundreds of times have I made an application of a mild remedy into the anterior nares that caused severe spasmodic cough, although when the same remedy was thrown down into the larynx by the spray producer No. 7, no cough was produced. In several instances I have seen complete aphonia during the application of the spray of vaseline alone into the nose. It was found that with some of the patients, the irritation produced by the air alone had the same effect, the vocal disability disappearing in each case so soon as the instrument was removed from the nose, showing plainly that irritation in the larynx can be produced by irritating the nasal cavity.

I have also had a great many patients who commenced to cough immediately on the introduction of an ear speculum into the auditory canal, and one

A spray producer that throws a vertical stream up into the pharyngo-nasal cavity. See pages 195 and 198.

A spray producer that throws a stream directly downward into the larynx. See pages 196 and 199.

who had for the period of over two years lost his voice, for fully one minute after each traction of the pinna of the ear upward and backward.

Now, if the larynx can be thus affected by manipulation of these organs in this way, is it not to be expected that a long continued inflammation in the pharyngo-nasal cavity will in time also affect the larynx?

I think that I can prove by inspection and treatment that fully nine-tenths of the coughs that are now treated with cod liver oil — which when taken is as beneficial for the foot as for the throat — and by the sponge probang and brush being thrust into the larynx, are caused by a chronic catarrhal inflammation of the nasal and pharyngo-nasal cavities.

The inspection of the vocal cords by the pharyngeal mirror, reveals them in a bright red or red color, resembling mucous membrane, instead of being pearly white, much like the white of the eye. The mucous membrane is darker red than usual, the blood vessels larger than usual and there are a greater number of them. As inspection proceeds upward, the color of the mucous membrane becomes still darker red, until the posterior nasal cavities are reached, where it is bluish red, showing that in this region the inflammation is much greater than elsewhere; also showing that it commenced here and extended to other localities. The pharynx and posterior surface of the velum, when they are cleaned of the

adhering muco-purulent secretion, has a relaxed appearance.

The posterior wall of the pharyngo-nasal cavity as well as that of the pharynx, are frequently studded with small elevations called follicles, and sometimes look like ædematous drops. Sometimes the uvula is very much elongated. When such is the case, it is frequently made the scapegoat of the tickling, and uselessly excised.

All of these patients have a history of nasal and pharyngo-nasal catarrh that must be taken into consideration, for treatment without this would certainly be unsuccessful.

This complaint is never idiopathic, it is always secondary, a sequence of a long continued and neglected pharyngo-nasal catarrh; therefore to treat it properly, the nasal and pharyngo-nasal cavities should be treated along with the larynx, using spray producers, whose combined action will cleanse and apply remedies to the fauces, pharynx, pharyngo-nasal and posterior nasal cavities, Nos. 2, 3, 4 and 5, 3 and sometimes only the spray producers that act on the posterior wall of the pharynx down to the arytenoid cartilages and into the larynx, Nos. 1, 6 and 74, spraying with each instrument, one-half dram of vaseline and two or at the most five drops of the following solution:

^{3.} See pages 195 and 198.

^{4.} See pages 196 and 199.

Ŗ.	Pinus canadensisgrs xy
	Glycerinæ [Price's] 3 ss
	Acidi carbolicigr ss
	Aquæ fervens
M	F Sol

The vaseline and the drops should be well mixed and made quite warm, almost hot before they are applied. Each application is followed by relief, even before the patient leaves the chair he will voluntarily say that his throat, air passages, and head feel easier. The remedy is agreeable, both as to taste and the sensation it produces. These applications should be made once daily, until the prominent symptoms have abated; then every other day until the secretions cease to be purulent; then twice each week until every symptom has disappeared, taking in all from six to twelve weeks. Should the symptoms reappear in the fall or spring they should be driven off by treatments given once or twice each week. Usually four to six treatments suffice on these occasions. Frequently a prescription for a laxative and diuretic will be needed, as most of these patients are of a costive habit.

Should a cold be taken during the course of the treatment, I prescribe ten grains of quinia, to be taken at bedtime and five grains next morning, with an additional laxative. I have followed this course with uniform success during the last six years.

Hygienic measures are of the utmost importance with such patients. Every precaution against catching cold by day or night should be taken. A restricted and graduated use of the vocal cords will be

found in the highest degree beneficial for all whose voice has become any way affected. I usually give the following directions:

Commence by reading for about one minute (if this can be done without weariness), then, on subsequent mornings, read one-half minute longer each time, that is, on the first day, read one minute; on the second day read one and a half minutes; on the third, two minutes, and so continue to increase the length of the readings to one-half hour, provided no contra-indicating symptoms are experienced. In this way the voice will frequently not only regain its usual tone and strength, but be stronger than it has been for months past, for it is usual with these patients that the voice has been failing even before they noticed the symptoms that they considered serious enough to require medical aid.

To improve the singing voice, my patients have found that it was quite beneficial to fill their lungs to their utmost capacity, and, with a little less than medium force, sound G continuously until the air in the lungs is completely exhausted; then in the same way sound A, follow this by sounding F, then B, then E, and so on, going each time higher and lower, until nearly the full compass of the voice is reached, always stopping on the least premonitory symptom of weariness.

It is usually best to take these vocal exercises immediately after the treatment, that is in the forenoon, as the effect of the treatment is always, or should always be of a relieving and soothing nature.

CHAPTER XXV.

THE METHOD OF AIR-SUPPLY TO THE MIDDLE EAR;
THE DENSITY OF THE AIR IN THIS CAVITY; THE
CAUSE OF THE UNIFORM CONCAVITY OF THE
MEMBRANA TYMPANI, AND THE FUNCTIONS
OF THE EUSTACHIAN TUBE.

The generally accepted theory of the method by which the air is supplied to the middle ear is that which was first promulgated by Mr. Joseph Toynbee, F. R. S. in 1853, namely: that the walls of the Eustachian tube are in contact when at rest, but that they are drawn apart by the tensor and levator palati muscles at every act of deglutition to such an extent that the "air can either enter or recede from the tympanic cavity," thus maintaining a tympanic air density equal with the surrounding atmosphere. proof that he and all others adduce in support of this theory, is the fact that the act of deglutition relieves the prominent symptoms and the main disability to the hearing that is occasioned by forcible inflation of the tympanic cavity by holding the nostrils closed, while air is driven from the lungs into the ears. This theory is still held by Tröltsch, Politzer, Gruber, Hinton, Roosa, Williams, Flint, Rüdenger, Foster, Hermann and every author, that I have read, who has expressed an opinion on the subject.

Roosa, in his work on the "Ear," page 213, says:
"The known functions are to conduct away 1 the

I. Italicized by the author.

secretions of the cavity of the tympanum, and to act as a ventilator of this part."

Prof. Rüdinger of Munich in Stricker's Manual of Histology, page 971, says: "In addition to conducting away 1 its own secretion and that of the vascular mucous membrane of this cavity, it is also able to produce a ventilation of the cavity by means of the mechanism which it contains."

He certainly, at this time, is in doubt as to the function of the tube, for he says: "Whether the Eustachian tube plays an important physiological rôle in the conduction of sound in the tympanum, and whether it has any connection with the voice, and if so, what there is, cannot be satisfactorily answered from the study of its comparative morphology. The final determination of these questions must remain for experimental investigations."

Foster in his last edition on Physiology, 1880, page 739, states that "the Eustachian tube serves to maintain an equilibrium 1 of pressure between the external air and that within the tympanum, and to serve as an exit for the secretions 1 of that cavity."

The "Eustachian tube is undoubtedly open during swallowing, 1 but it is still disputed whether it remains permanently open, or is opened only at intervals."

Since the year 1868 and up to the present time, I have had very frequent opportunities of examining patients afflicted with abnormally open and abnor-

^{1.} Italicized by the author.

mally closed Eustachian tubes. Observations made on these patients have led me to come to conclusions that differ very materially from those entertained by Physiologists and Otologists of the present day, 1st, on the method by which air is supplied to the middle ear; 2d, on the density of the air within this cavity; 3d, on the cause of the uniform concavity of the membrana tympani; and 4th, on the functions of the Eustachian tube.

In August, 1868, I gave to Prof. John T. Hodgen, of this city, as my views on this subject, that Toynbee, Tröltsch, Roosa and others were in error when they said that the supply of air to the middle ear took place only during the act of deglutition, and that observations made up to that time, had proved conclusively to me that air continuously entered the middle ear; also, that the air in the middle ear was always in a rarefied condition. In September of the same year I read to Prof. Hiram Christopher the cardinal points of this subject contained in this and the two succeeding chapters. Subsequent to this time I very frequently gave my views in full and read my paper on this subject, and gave it to be read by a large number of friends, among them Dr. David Prince, of Jacksonville, Ill., and Dr. Homer Judd, formerly of this city.

Although perfectly satisfied that my conclusions were correct, yet I did not read them before the St. Louis Medical Society until February, 1872. In these days of rapid medical progression, it is not safe nor best to wait so long a time before making public new

physiological facts, but as what I was to announce differed so materially from the theories of those in whom the profession had great confidence, I hesitated to contrast my views with their learned and matured opinions, and were it not that I had then tested my conclusions through a period of nearly five years I would not, even at that time, have presumed to have disputed their opinions on such an important subject.

The following are the series of conclusions that I arrived at from observations made on my cases and read before the Society:

1st. That during the act of deglutition the Eustachian tube is not an open passage into the tympanum.

2nd. That the walls of the Eustachian tube are constantly in slight contact.

3rd. That the air continuously permeates the Eustachian tube into the tympanic cavity.

4th. That the air in the normal tympanic cavity is not of equal density with that of the surrounding atmosphere, the air in the tympanum being rarefied.

5th. That one of the functions of the Eustachian tube, maybe the principle one, is the maintenance of this inequality of air density.

6th. That the rarefied condition of the air in the tympanum is the cause of the uniform concavity of the membrana tympani.

7th. That a certain degree of uniform pressure on the fluid in the internal ear by means of the membrana tympani and the small bones of the ear is essential to normal hearing. We cannot make experiments on the Eustachian tube by instrumental means, without incurring great risk of doing injury to this very important passage, but it is sometimes abnormally open, at other times abnormally closed. As the disability arising from these opposite conditions may be temporarily overcome, so that the hearing can be increased equal to or beyond the patient's usual acuteness, we have excellent opportunities of judging what is the normal state of this tube (that is with respect to its being an open or closed passage), the normal air density within the tympanic cavity, and the cause of the uniform concavity of the membrana tympani. Knowing these, we can easily determine what are the functions of the tube itself.

I will now relate the cases from which I made the observations that led me to come to the above conclusions. I have, since that time, had so many similar cases in my practice, that I am sure that they cannot be considered as uncommon in the practice of any specialist.

The prolixity of the history of these cases will be justified by the valuable information they shed on this rarely mentioned, yet really important subject.

I take it that the following is a fair deduction: If the Eustachian tube is opened into the middle ear by the tensor and levator palati muscles for normal ventilation of this cavity, at every act of deglutition, then anything that might open the tube, aside from the action of the muscles mentioned, would not, on

account of this opening, be a cause of defective hearing.

From the symptoms observed in the following cases who had autophony, or an abnormally increased volume of their own voice, heard through the open Eustachian tube, it is expected to prove that the mere opening of this tube, for a short or long period of time, is a cause of too great a disability to the organ of hearing, to admit of its being open during the act of deglutition, without producing some if not all of the same phenomena; and that while the Eustachian tube is in a patent or abnormally open condition, the membrana tympani is less concave than normal.

CASE IX .- Feb. 5th, 1868 .- Otto Z-, German, æt. about 38 years, farmer, from Columbia, Mo., applied to be relieved from excessive noise in his left ear while talking. He had been deaf in this ear since 1862; he supposed that it was occasioned by long exposure in the woods. This phenomenon in the left ear first appeared eight days ago, and with it considerable increase of deafness and a sensation of fullness, or as if he had something in the ear. He hears his voice in this ear first. It would not be exactly correct to say that he heard all of his words at separate intervals, but they lap one upon another, producing quite a confusion of sounds. When pronouncing one short sound quickly, as "ah," through the nose, there was no lapping, but two sounds, one following the other in instant succession; the first sound in a strong, hollow, deep tone immediately in this ear; the second one in the ordinary tone, and

heard from without. Several nights ago he was awakened from sleep by a blowing sound in this ear, no doubt occasioned by his respiration, as it occurred only during expiration.

On inspection of the membrana tympani of the left ear, the concavity was found to be slight. I will say that the curvature was not so remarkable for shallowness as to attract my attention even during the first two days' examination. It was not until I had made up my mind that the tube was abnormally open, that I noticed the contrast between this, and that of the right ear. The hearing distance with the watch with right ear was $\frac{3.6}{9.6}$, left $\frac{C}{9.6}$. On examination of the pharyngo-nasal cavity, it was found coated by a large accumulation of offensive mucopurulent secretion, the whole mucous membrane being affected with a chronic inflammation. The mouth of each Eustachian tube was quite large and much congested.

While examining his left ear he twice asked me if I could not hear him talk through it; the sound of his voice in this ear was so loud to himself, that he thought others must hear it also.

The posterior nares syringe was used with warm salt water (3j-Oj) to clean out the offensive secretion above and behind the soft palate. The first injection washed out a large quantity of this matter. After the recovery from the choking sensation occasioned by this injection, he found, upon answering a question, that the sound of his voice in the left ear had disappeared. It required nearly one quart of water to clear out the pharyngo-nasal cavity.

Feb. 6th.—The sound of his voice in the left ear was absent for nearly two hours after the last treatment, returning after he had used his handkerchief to blow his nose. The posterior nares was again washed out, using about half a pint of warm salt water. The first syringeful again stopped the phenomenon.

Feb. 7th.—The sound of his voice in this ear did not return for three hours after the last treatment. happening this time without any known cause. Last night he was again awakened by the blowing sound in this ear; this is still present. As the patient insisted on my listening to it; I took the aural auscultating tube1 and placed it in this ear. I found to my great surprise that the blowing sound was occasioned by his respirations. It was much more distinct when he breathed through his nose with his mouth closed; then it sounded somewhat like blowing over the mouth of an ounce bottle; when his mouth was open it could not be heard so distinctly; and when he breathed only through his mouth, it was not heard at all. His voice, as heard from his ear, while not nearly so loud, had the peculiarity of the hollowness and proximity that can be illustrated by placing the stethoscope near the larynx of a patient while he is speaking.

After one injection of the warm salt water, all these peculiarities were lost, but were made to return again — except the hearing of the respiration — by the repeated blowing of the nose. The aural auscultating tube was again applied to this ear and the previous observation confirmed. Another douche with the syringe again shut out the sounds, but were caused to return by more blowing of the nose. Pol-

I consider this a preferable name to that of "otoscope," or "diagnostic tube," being more descriptive of the use of the instrument.

itzer's air douche was not used for fear of injuring the membrana tympani thus exposed.

Feb. 8th.—The relief from hearing his voice in this ear lasted until he fell asleep. On awaking this morning he found the symptoms the same. Says the upper and posterior portion of his throat is somewhat painful, and that his hearing is not quite so good. Watch heard in right ear, $\frac{30}{96}$, in left, same as before stated. The same examination with the aural auscultating tube, and the use of the syringe, fully confirmed yesterday's observations, the only diference being that it required greater exertion on the part of the patient to clear the Eustachian tube after it was filled with water.

Feb. 10th.—The patency did not return until yesterday morning, being absent about twenty-four hours. Has more pain in the head than usual; tinnitus in right ear; hearing in this ear \(\frac{28}{96} \). According to directions, yesterday he snuffed warm salt water into his left nostril, while his head was inclined to that side. After repeated efforts, this had the effect of shutting off the sound of his voice from this ear, but the relief was not of long duration. The same examination with the aural auscultating tube, followed by the use of the posterior nares syringe, was repeated to-day as often as the Eustachian tube could be cleared of fluid by blowing the nose, confirming all that was before observed.

Feb. 11th.—The tube did not open until about ten o'clock last night. This morning he was successful in forcing water from his mouth up behind the soft palate into his nose, while his head was inclined to the left side. This stopped the sound of his voice in this ear, lasting for an hour or two, or until he coughed

or blew his nose, when he could again stop the sound of his voice with more water.

This plan of experiments and observations was continued every other day until the 24th of February, at which time the autophony was permanently shut off. This was apparently brought about by the application of a grs. x solution of argenti nitras to the mouth of the left Eustachian tube, by means of a sponge, and held there about two seconds.²

On the 2d of March he could hear the watch with this ear when it was just away from contact, on the 6th when ½" from it. The membrana tympani was now more concave, and the "cone of light" smaller and brighter (6th and 7th Cons.). The hearing with the right ear on the 6th of March, $\frac{34}{96}$. Although this is two inches less than when he first presented himself, yet he claims that he can hear very much better, especially that he is not so much in doubt as to the direction from whence sounds come.

After the experiments and observations on the 7th of February (1868), I considered that the case had demonstrated itself to be that of an abnormally open Eustachian tube, and I then conceived the idea that it was necessary to have this passage constantly closed for normal hearing. Soon after this my doubtful opinion was converted into almost positive conclusions by finding that Mr. Toynbee made a mistake in his first experiment, given to prove the correctness of his theory; also that he was in error in the

This is not good practice. I would not make such an application now. Spraying the pharyngo-nasal cavity to reduce the catarrhal inflammation is much preferable.

^{3.} Toynbee on Diseases of the Ear, page 192.

diagnosis of his cases that belong to this same class, reported on page 155 of his work.

Case X .- About the latter part of March, 1868, I noticed my friend, Dr. Charles K-, of the firm of A. M. Leslie & Co., of this city, close his nostrils with his thumb and forefinger, and instantly making an inspiratory effort while his mouth was also closed. The reason for this procedure instantly came into my mind. I made the remark to him at the time, that he abstracted air out of his tympanic cavity to drive away a disagreeable fullness in the ear, and to prevent the sound of his voice from going into his ear, and also to increase his hearing. He replied that I was right, stating that he frequently, may be fifty to a hundred times during the day, was compelied to do this, especially after taking a cold in the head, to which he was very subject. Not long after this I had frequent opportunities of examining his ear and found that previous to the abstraction of air from the cavity the membrana tampani was but slightly concave, the "light spot" and whole surface was dull; but so soon as he made a quick inhaling effort, with mouth and nostrils closed, the dullness disappeared, the concavity was increased, and with this change, the removal of the sensation of fullness in the ear, the muffled, deep sound of his voice, at the same instant the increase of his hearing for outside sounds. (6th and 7th Cons.)

Case XI.—The next case of this character that came under my observation was (Jan. 8th, 1869,) Mrs. Mary E. T——, aged about twenty-eight years. Her hearing in the left ear had been affected for about five years; in the right, about one year. She applied for treatment on account of the direct trans-

mission of her voice through the left Eustachian tube to the left ear. This could be considerably increased by yawning, at the same time breathing out through the nostrils. While doing so, with the aural auscultating tube introduced into this ear, the sound of her voice could be easily heard. All deep tones were much more distinct. The "ing" in pronouncing "morning" was very distinct.

On the 9th of January the Eustachian catheter was introduced well into the mouth of this tube; with the aural auscultating tube it was noticed that the sound of her voice was nearly shut off, but the flapping or purring sound of the catheter was very marked, seeming right in my ear. After an inflation by this means, she noticed that the Eustachian tube remained closed a little longer after an inhaling effort similar to Dr. K.'s.

After injecting warm water, having a little slippery elm dissolved in it, into the left nostril, while the head was inclined to that side, the sound of her voice was shut out from her ear for several hours.

When the Eustachian tube was patent, so that, with the aid of the aural auscultating tube, her voice could be heard through it, the "cone of light" was broda and dull in lustre, but instantly, on performing the act of deglutition with the nostrils closed, it became smaller and brighter, proving conclusively an increase of the concavity of the membrana tympani by rarefaction of the air in the cavity and closure of the Eustachian tube; at the same instant the hearing of her voice, abnormally, in this ear was cut off, but the hearing of external sounds increased.

Case XII.—Rev. Dr. B. F. C., of this city, aged about fifty years. About the year 1862 his left ear was injured by an unexpected discharge of a cannon near him. On examination of the membrana tympani it was seen to be very concave, the "bright spot" quite small, showing that the Eustachian tube did not allow sufficient air to pass into the tympanic cavity; the pharyngo-nasal space was found to be affected with chronic inflammation of the mucous membrane. For this he received a long course of treatment, but with indifferent success.

On January 24th, 1872, he consulted me for a directly opposite disease of the Eustachian tube, that of patency—hearing his voice abnormally loud in his left ear. This was apparently occasioned by a severe cold in the head. His voice sounded to him as though it was immediately in his ear, and seemed double, or as though some one was speaking the same words just back of his left ear. This was so very annoying that he could not think with freedom while preaching. On one occasion he was compelled to desist from preaching on account of it. Accompanying this, was fullness in the ear and increased dullness in hearing.

With the aural auscultating tube, the peculiar sound of his voice could very easily be heard. The greatest contrast between any two sounds heard from this ear was that of "a" and "ing;" the former could scarcely be heard; the latter was remarkable for its distinctness.

Strong pressure on the tragus, closing the auditory meatus, decreased the autophony, but did not entirely check it. For the purpose of ascertaining whether or not it was the mere pressure that caused this disappearance, I had him press equally as strong into the meatus the end of the aural auscultating tube; this had no effect whatever upon the autophony. I then placed a piece of sheet rubber over the end of

the tube and pressed as before; this had the same effect as the pressure on the tragus. These experiments were repeated several times with the same result.

Two drops of warm salt water placed into the auditory meatus (preparatory to the application of the constant current of electricity for the treatment of the disease) had no apparent effect in checking the phenomenon; three drops more decreased it a little. When the canal was about half full there was still a little resonance on phonation; but when it was as full as it could hold, there was none at all. This experiment was not repeated. The electricity removed every symptom of patency for several days, and when it returned it was so slight that I could not hear his voice at all from the ear.

Case XIII.—Jan. 27th, 1872.—Miss Mollie K——, of this city, aged 19 years. She had perforation of both membranæ tympana and otorrhæa in both ears since she was a small child. The following are the symptoms of her autophony, in her own words, viz.:

"I have had breathing in my right ear many times during the last winter, and up to the present time, each attack lasting sometimes an hour or two. At such times I have but little matter in my ear, and feel as though something had moved away; then I hear the sound of my breathing. I always drive this away by syringing my ear with luke-warm water. It is such an unsufferable feeling that I have to keep washing out my ear until it stops. As soon as the

^{1.} These two experiments on this and the following case were suggested by reading Dr. Brunner's article, in the Arch, Opht, and Oto., Vol., IINo. 1, page 110. 1871.

water stops going into my throat, then I know that the sounds will stay away."

Question.—What does the noise in your ear resemble?

Answer.—"It sounds like a very loud breathing in the head, striking the ear drum quite hard; and, if I speak, it sounds as if I was in an empty room, and as though I heard the echo of my voice. It is not the voice that comes from my mouth that hurts and sounds so loud in my ear, but that part of it that goes to my ear from my throat. The voice that comes from my mouth sounds last, and is like the echo in the room. I never speak loud at those times, because it hurts the ear drum and causes my head to ache very badly."

. Ques.—What is the condition of your ear when this occurs?

Ans.—"It occurs at a time when I have a very bad cold in my ear, and when it is not running; at the same time my nose is hot and dry. My breath, coming from my ear into my throat, is very offensive."

Ques .-- Is your hearing more defective at such times?

Ans.—"No; I hear as well at any time; sometimes I think that I hear better."

Ques.—Have you ever tried to stop this unusual sound of your breathing by closing your ear with your finger, or anything else?

Ans.—"Oh, yes; but that does no good; it only keeps me from hearing other persons."

Ques.—Did it stop the noise a little, and make you feel a little better?

Ans.—" Not in the least (with emphasis); nothing but something run away into my car would do any good. Sometimes, after washing my ear with water,

the sounds would [after being away] soon begin to return, then I have wet the cotton with glycerine and put this in it, if I felt it [the resonance] coming on, I would squeeze the cotton a little so that some of the glycerine would run farther into my ear, at the same time I would hold my head on my left shoulder; then the breathing sounds would stop."

This closes the history of the cases, on the observations of which I founded my seven conclusions.

Their symptoms prove, conclusively, that when the Eustachian tube was opened by a small quantity of mucus acting as a wedge, so that the air in the tympanic cavity became of the same density as the external air, the disability to their hearing was so marked that it *precludes* the possibility of the tube being opened, even for an instant, during the act of deglutition without occasioning the same phenomena.

Each one of the three first patients state positively, that on the *instant* that the tube opened, they experienced a sensation of fullness in the ears, and a marked decrease of hearing, and on inspection on these occasions, a decrease of the concavity of the membranæ tympana was observed; and, that on the *instant* that the tube was closed, the fullness disappeared and the hearing increased, and with this, inspection proved time and again the increased concavity of the membrane. The symptoms of the fourth patient, who had perforation of both membranæ tympana, fully sustain the statements of the other patients, as to the disagreableness of the voice passing to the ear through the Eustachian tube.

With this patient, the patent tube did not decrease the hearing. Why? Because the open tube could not further increase the air density in her middle ear, it being already equal with the surrounding atmosphere, through the perforations in the membrane.

This proves that patency of the Eustachian tube per se is not a cause of deafness, but that defective hearing follows as a consequence of this condition of the tube allowing too much air to enter the middle ear. The super-abundant air allows the membrane to fall outward, both by its own weight and its own contractility, so that it leaves its normal position, drawing with it the small bones of the ear, thus preventing due pressure on the fluid in the internal ear (7th Con.). Although the sound waves may strike the membrane in this condition and be transmitted to the small bones, yet, if these do not press upon the perilymph of the internal ear, no impression is made upon the auditory nerve.

There are other deductions that could be taken from the symptoms of these patients, but I reserve them for another chapter.

As I am not willing to have so important a subject rest on the authority of my observations alone, I will introduce, in the next chapter, the histories of several cases observed by gentlemen of high repute, whose views respecting the functions of the Eustachian tube are at variance with mine, but perfectly in accord with those of the profession. The symptoms that they observed in their patients, prove, positively, the correctness of my conclusions.

CHAPTER XXVI.

THE METHOD OF AIR-SUPPLY TO THE MIDDLE EAR;
THE DENSITY OF THE AIR IN THIS CAVITY; THE
CAUSE OF THE UNIFORM CONCAVITY OF THE
MEMBRANA TYMPANI, AND THE FUNCTIONS OF THE EUSTACHIAN TUBE.

[CONTINUED.]

CASES THAT OCCURRED IN THE PRACTICE OF OTHERS.

To show that preconceived opinions have not biased my observation of the cases related in the last chapter, a few more belonging to the same class will be placed before the reader, which were observed and reported by Aurists whose opinions as to the cause of the phenomena attending them are entirely at variance with those presented by me, and whose views concerning the functions of the Eustachian tube are in accord with those entertained by the profession at the present time.

The first series of cases that I will give are three mentioned by Mr. Toynbee. The close resemblance of the prominent symptoms of his cases to my cases is very manifest. They are found on page 155 of his valuable work on "Diseases of the Ear," under the head of "Relaxation of the Fibrous Lamine of the Membrana Tympani." He states that "The causes of this are—1st, the effects of an ordinary cold, producing hypertrophy of the mucous layer; 2d, inflammation of the fibrous layers. From either of these causes the membrana tympani may lose its nat-

ural resiliency, and become flaccid, so as to fall inward and approach more nearly the promontory than is natural."

I wish to remark here, that it is not possible for the membrana tympani to fall inward because of relaxation. It is well known that the upper margin of the the membrane is 6 mm. nearer the external orifice of the ear than the lower margin. It is evident, therefore, that every movement made in the direction of the promontory is really an upward, instead of a downward movement, and that relaxation with equal air densities on both of its sides—as did exist in those cases—would not cause it to take that direction, but an opposite one.

His description of the state of the membrana tympani of his first case, is strong proof that the concavity was at its minimum, for he states that the "bright spot [is] elongated," showing a comparatively flat condition of the membrane. Another evidence of the patency of the Eustachian tube of this individual, is that the act of deglutition, performed with the nostrils closed, relieved his disability (4th Con.), the improvement continuing until the same act was performed with the nostrils open, which, with this patient, again gave rise to patency and its consequences.

With the second case "the bright spot [of the membrane is] much larger than natural," which proves that its concavity was decreased as much as the traction of the tensor tympani would allow it. "The rumbling sensation and the deafness are both

temporarily relieved by suddenly and forcibly drawing in the breath through the nostrils" (4th, 5th, 6th and 7th, Con.). Here the hearing was increased by closing the patient's Eustachian tube, at the same time abstracting air from the tympanum in a manner exactly similar to some of my cases. He adds, "The patient has thus required the habit [?] of incessantly snuffing the air, which is exceedingly unpleasant to himself and to every one around him."

In the history of his third case he has not been as explicit in the description of what he saw, or the method taken by the patient for relief; but taking into consideration its connection with the other cases, and his using the same expression concerning the method employed for obtaining temporary relief, there is evidence enough to consider it to be similar in character. In the latter part of the history of this patient, he states "the hearing remained much better, except during attacks of colds, when the old habit of clearing the ears, by forcing air into them, was had recourse to." It is evident that the habit of "clearing the ears" is similar to those of his other cases, notwithstanding he calls it forcing air into them.

This examination of the history of his cases readily proves that he was mistaken in the direction that the membrane took, when he instructed them to perform the act of deglutition with their nostrils closed, as this causes it to rise and approach the promontory, instead of, as he supposed, forcing it outward and away from it; consequently, he was in error as to the cause of the disability in their hearing, showing that his theory—namely, that for normal hearing, the air density in the middle car must always be equal with the surrounding atmosphere,—had no foundation in fact.

Let us compare the symptoms, as observed in his cases, with his theory:

The patient finds that every time that the Eustachian tube is open, the hearing is decreased (1st Con.).

They are compelled to abstract air (4th Con.) for the purpose of increasing the concavity of their membranæ tympana (6th and 7th Cons.) to increase their hearing, and also for the purpose of closing the Eustachian tube [2d Con.].

He says that the Eustachian tube must be opened at each act of deglutition for perfect hearing.

He says that the air in the tympanic cavity must "be always of the same density as the outer air."

Again, while the Eustachian tube remained closed, (2d Con.), the increased concavity of the membrana tympani remained stationary (5th Con.). Now, as this condition of the tube and the membrane is continuous upon the permanent recovery of the patient, and as there is a process of air exhaustion going on continually in the middle ear, therefore, if the hearing remains uniform, it proves the uniform reception of air into the middle ear (3d Con.).

While it is evident that the traction of the tensor tympani upon the manubrium accounts in a great measure for the concavity of the membrana tympani, it is seen that the facts observed in those cases prove that it did not maintain its uniform concavity, especially that portion of it which reflects the "light spot;" and that this condition is maintained by the excess of outside air pressure. When the excess was not present, the membrane assumed as flat a form as its attachments would allow it to take; that is to say, that the unassisted traction of the muscles maintains it in the same form that a cone, if pressed against it, would do; but the excess of outside air pressure, in addition to this traction, maintains it in a condition that a ball would do, if put in the place of the cone; so that a section of the membrane, passing through the umbo, would present a curved line, not an angle.

The next case of this class that I will quote, is taken from the "Archives of Ophthalmology and Otology," Vol. II, No. 1, page 107 (1871), reported by Dr. Gustav Brunner, of Zurich, Switzerland.

This case is given in support of the theory, that the closed Eustachian tube, assisted by bone conduction—not fluid in the middle ear, as claimed by Gruber—is the cause of the increased resonance or autophony in this patient.

As I will attempt to prove, by the symptoms of this case, that it was an abnormally open condition of the Eustachian tube, instead of an abnormally closed condition of this passage that caused the phenomena, I will be compelled to disagree, in toto, with his conclusions, while accepting the results of his ingenious experiments.

His case was a female, "45 years old. Had be-

come deaf after having catarrh the whole winter, but never before had any trouble with the ear. In April, 1870, sudden pain in right ear, without any distinct history of taking cold." * * * "She does not complain of any particular pain, but a feeling of stoppage of the right ear; particularly, however, that her own voice resounds very strongly in the right ear in such a manner that speaking is very disagreeable to her; even her own respirations sound so loud and sibilant as to be troublesome. She also hears every motion of the jaws with unusual distinctness." * *

- * "By auscultation with the otoscope one perceives quite a difference between right and left ear. On the right side the voice of the patient sounds uncommonly loud and hollow, with a tremulous continuation of tone; speech even in common conversation, as though one was speaking in a vaulted chamber or in a long speaking tube, and, on raising the voice, the sound is reduplicated; in quiet breathing, sound through the otoscope remarkably loud and sibilant."

 * * "I introduced the catheter on the right side and blew air in by means of the air bag, when I heard a strong roaring or blowing upon auscultation, which made, in spite of its intensity, the impression of a distinct noise arising from the palate, or, at most from the mouth of the tubes.
- "The air douche was without permanent influence upon the phenomena. I now made, in view of Gruber's assertion although from the results of the examination of the membrana tympani the presence of liquid in the tympanic cavity was not at all probable—a small preforation into the right membrana tympani.

"The autophony was not altered by this proceeding, and no air issued from the opening, in spite of

strong and repeated douches of air through the catheter (the tube was, no doubt, still closed). As soon, however, as the air, after repeated efforts, passed through the opening in the membrana tympani with an audible hissing sound, the troublesome resonance, both subjective and objective, disappeared, as if by magic, and did not return when I injected a weak solution of zinc by means of the catheter."

As soon as he blew out the wedge of mucus that was holding the tube open, it closed; therefore, the sound could not pass thorough it. With his idea of the cause of the phenomena, the disappearance was certainly like magic, but a proper understanding of the condition of the tube, dispels the magic, and brings the phenomena down to a physical cause. The question may be asked, why did not the wedge of mucus fill the whole caliber of the tube, and thus prevent the entrance of sound to the middle car? The answer is, that mucus is poured out only where the glands secrete it. Mucous glands do not exist in the portion of the tube that forms the capillary opening, but only in the vertical portion that forms the sides or walls that are constantly in apposition. As mucus will not flow upward, it remains where it is poured out, that is, under that part of the tube where no capillary opening exists; here the mucus, acting as a wedge renders patent the part of the tube that nature intended should be continuously closed, thus allowing the free access of air and sound from the larynx. He continues:

"I remarked particularly that not the slightest so-

cretion made its appearance through the membrana tympani. Now the air passed whizzing through with great ease by the patient's simply blowing the nose, and the improvement continued until next morning. In the evening, however, the patient was no longer able to force any air through the membrana tympani.

"When I saw her two days afterward the opening was closed; no reaction had followed the paracentisis, but the group of troublesome symptoms were present as strongly as before. State of the membrana tympani same as in the beginning.

" * * * * this time the air douche availed nothing. Only after I had blown in some solution of zine the resonance of the voice suddenly disappeared, and remained absent till the next morning. (To me this observation, which I subsequently repeated, is explained as follows: that after the moistening of the collapsed walls of the tube the stream of air more easily finds admittance). Two days later the patient presented herself again. The autophony continued with unabated violence. Repetition of the air douche was of no use, and even the injection of fluids at this time proved negative."

If his theory of the cause of the disappearance of the autophony—this is, by opening the tube— is correct, would he not have been more successful to have introduced and retained a catheter in the Eustachian tube, as recommended by Dr. Jago to nrove patency! Is it not much more reasonable to suppose that the water occoupied all of the free space in this small and narrow passages, as it would do in any opening of the

^{1.} Jago on the Eustachian Tube.—British and Foreign Medico-Chirurgical Review, January and April, 1867, page

same size and shape, and, while remaining there, act as an obstruction to the passage of sound, in a manner precisely the same that it would have done had it been injected into Dr. B.'s aural acscultating tube while he was examining the patient's ear with it? The following quotations plainly show that in this I am correct:

"The patient stated that the air began to pass into the ear, but was suddenly interrupted. I now pushed a bougie of about 1 mm. in thickness through the catheter. At the middle of the tube it was arrested, and could not be carried any further; but the autophony had disappeared. If I pulled the bougie back a little the symptoms reappeared, and disappeared again when the bougie was introduced. Thereupon, I took quite a thin bougie, \(^3\)4mm., which was also arrested at the spot mentioned, and found great resistance, but at last entered the cavitas tympani; whereupon, the autophony ceased, even with the otoscope.

"I usually injected a solution of zinci sulphas (grs. iij, \(\bar{z}\)j), and I remarked particularly that the injected liquid never produced autophony; on the contrary it disappeared, as I observed above, sometimes not from the effect of the air douche, but by blowing in a

few drops of the liquid.1

^{1.} Italicized by the Author.

Such an array of symptoms, all pointing plainly one way, namely, that she heard the sound of her voice through an unusual avenue to her ear, is not to be found, not even in the history of Dr. Jago's own case, related by himself. Yet Dr. B. repeats, on page 117. "It appears to me most natural at present to seek the cause of its frequent alterations in a stoppage of the tubes."

"That such really existed is shown by the result of the auscultation, and by the fact that the solution of zinc injected through the catheter never or seldom occasioned any burning in the ear."

I think that it is not necessary to spend much time in contradicting his conclusion, namely, that the auscultation demonstrated stoppage of the tube, for the quotations already given above state that through the aural auscultating tube introduced into her ear, "on the right side, the voice of the patient sounds uncommonly loud and hollow," * * * * "in quiet breathing, sounds remarkably loud and sibilant;" and the sound from the catheter gave "the impression of a distinct noise arising from the palate, or at most from the mouth of the tube." Even if he had desired to describe the symptoms of patency, as proved by these phenomena, he could not have used more descriptive language.

The history of this case will suggest, upon reflection, that the reason that the injection of the zinc solution did not reach the cavity of the tympanum, might not have been on account of closure of the Eustachian tube, but, on the contrary, because of its being too

open. I considered that his inability to successfully inject the solution into the tympanic cavity, is another fact that proves the correctness of my views, that is, that this case had an abnormally open Eustachian tube, so that "air could either enter or recede from the tympanum."

Evidently, if the tube had been long closed, there must have been rarefaction of the air in the tympanum and mastoid cells by absorption by the mucous membrane; therefore, just so soon as equalization of the air density transpired upon the opening of the tube by the injection, the liquid must of necessity have been drawn into the cavity by atmospheric pressure at the same moment, or even before the air entered it.

I am free to affirm, that it is almost impossible to force a liquid into a long, narrow tube, similar to the Eustachian canal with one of its extremities closed, because of the condensation of the air in the further extremity of the tube, and, that the only method by which a fluid can be made to enter such a passage with facility, is, as is found in long closed Eustachian tubes, by a rarefied condition of the air in the tympanum, occasioned by its absorption by the mucous membrane of the middle car and mastoid cells. I mean, that it is not possible that a fluid can be injected into a tympanic cavity having a patent Eustachian tube and an imperforate membrana tympani, because the air already in the tympanum and the tube—which cannot be condensed without

causing great pain—has no avenue for escape, the tube being too small in caliber to allow the liquid to enter and the air to come out at the same time; but if there is a perforation of the membrane, then there will be no difficulty in injecting the solution into the tympanum, for the air in the cavity can and will escape through this opening,

He gives other reasons in the support of the theory that the closed tube always accompanied this autophony, but the only one I will mention is found on page 118. Its ingenuity and seeming correctness calls my attention to it.

He says: "It might seem strange that tympanophony did not appear during the introduction of the bougic, but we shall cease to wonder at this when we consider that the tube is not a round, but a fissureshaped canal; the bougie cannot, therefore, fill up the whole cavity, but will act as a wedge, holding the walls asunder."

Keeping in mind the comparative dimensions of this collapsed tube shaped passage and the bougie, I think that it is a little doubtful that even the larger one would act as a wedge, holding the walls above it or below it sufficiently apart for the sound of her voice to enter, without taking into consideration that at the same time there was a constriction—which must have been membranous and nearly circular—so great that it could not be made to pass, and the one of \(\frac{1}{4}\) mm. required pressure to overcome "great resistance." How could the sound pass through that part of the tube occupied by this

membranous and circular constriction, while the larger bougic filled it to its utmost capacity? In fact the sound did not pass, for he says that the phenomenon disappeared while the bougie was pressing upon this constriction.

On page 115 he gives what must be considered as positive evidence that there had been no closure of the Eustachian tube, but the opposite condition, viz.: As the hearing increased "from 0 to 16 centimeters," he says, "The injection of the membrana tympani has disappeared, and it shows, instead of grayish cloudiness, and some increase of concavity!—nothing particular" (4th, 5th, 6th and 7th Cons.).

What could increase the concavity of this membrane? Facts and recognized authority answer, air absorption within the middle ear and mastoid cells, causing rarefaction. As air abstraction could not thus effect it with an open tube, it proves that the tube was closed.

That a rarefied condition of the air in the tympanic cavity is the normal condition is proved by the fact that increased hearing was concomitant with the increased concavity of the membrane and closure of the tube (4th and 7th Cons.).

On page 124 he gives his theory of the cause of these phenomena:

"To return to the history of our patient, the reason why only her own voice and breathing, but not the sounds produced outside and in the air, showed a

^{1.} Italicized by the author.

strikingly louder and changed tone, can only be that, in the first instance, the source of sound lies in our own body, and that, besides the conduction through the outer air, the conduction through the solid parts exest an influence.

"From this circumstance we must explain the augmented resonance of the voice. Taking it for granted that complete closure of the tubes is favorable to resonance in the drum, it will appear nevertheless strange that resonance appears only in the sound of our own voice, and not likewise in that of others, and we are obliged to seek the conditions for this resonance in the conduction of the bones."

The effort in these two sentences is to prove that the autophony is propagated to the ear by the conductive property of the bones, assisted by complete closure of the tube. Indeed, he must consider this bone conduction as the greater cause, for he has admitted that we have too large a class of cases of obstructed tubes without autophony to place much stress upon this condition of the passage as occasioning these phenomena.

The property of conduction in any substance is not changeable suddenly, but in this case we are forced to say that it was arrested in increasing the resonance of the voice by the air douche, by a few drops of fluid injected into the Eustachian tube, by gargling, by the large bougie that could not, according to his opinion, open the whole length of the tube, and by the smaller one that did, after considerable force, penetrate to the cavity, for all of them did cut off the increased resonance of her voice. But did

they at the same time change the conductive property of the bones? Was not this property in them just the same after the resonance had disappeared as before? He says: "By auscultation with the otoscope one perceives quite a difference between the right and left ear." No one can doubt but that the bone conduction must have been equal on both sides of the head.

On page 110 he relates two experiments, viz.:

"All these phenomena, subjective and objective, completely disappeared when the right ear was filled with water; the patient's own voice then sounded as usual. This was also the case upon stopping the auditory canal by strongly compressing the tragus, but upon opening the auditory canal all the symptoms reappeared immediately."

I have made the same experiment on one of my patients, who had an imperforate membrana tympani (Case XII, Rev. Dr. C.), with the same result. My explanation at the time—and the facts seemed to bear me out—was that the column of water interfered with the vibrations of the membrane, and that this interference also occurred from the closure of the auditory canal by the condensed air pressing upon the imperforate membrane. It will be remembered that pressure, without the means of condensing the air, did not thus effect the resonance. It will also be remembered that my patient observed that when only a few drops of water were on the membrana tympani it had but little effect, but when filled, the autophony was gone. That the glycerine in the auditory

canal of Miss K. (Case XIII) should have the effect of stopping the increased resonance is not to be wondered at, because it passed directly through the perforated membrana tympani into the Eustachian tube, closing the avenue for the sound to reach the ear, requiring only two or three drops to do it. Strong pressure on her tragus had no influence whatever in diminishing the autophony; but with the Rev. Dr. C. it had a modifying effect, but only when the canal was completely closed at the same time.

I will now make some quotations from an article written by Dr. Jago, of England. He has contributed two papers upon the subject of Patency of the Eustachian tube in the British and Foreign Medico-Chirurgical Review, one in the January and the other in the April numbers, 1867.

I desire to use these quotations merely for the purpose of showing that I am not mistaken with respect to the character of Dr. Brunner's and my cases, namely: that they are, as asserted, those of abnormally open Eustachian tubes.

He was afflicted with this very annoying disease, and devoted much time to various experiments upon his ear, and carefully noted the symptoms accompanying the disease and these experiments. There is not any probability of his being mistaken when he says, that "It is now full fourteen years since I have understood the phenomena which an open Eustachian tube entails."

I will make the quotations from pp. 181, 182 and 183:

"But I am confident that any one who may provide himself with a tube open at both ends, just the size to pass through a nostril into the throat, and having projecting from it another with one of its ends suitable for being passed into the Eustachian tube may, by thus introducing this into one of his tubes so that the air may pass freely from it into the drums, verify all my main experiments.

"In proof of this explanation I may adduce that, whenever I have been teased by the patency of the tube, I have always been able to close it for some instants by an inspiratory movement with nose and mouth stopped." (4th, 5th and 6th Cons.)

"I will subjoin, that in explosive expirations, or in speaking, coughing, hawking, sneezing, the pressure upon membrana tympani is painful, and in the more violent, particularly involuntary kinds, threatened its integrity." * * * * "Every word spoken whilst the tube is open strikes the membrana tympani through it, and is thus heard many times louder upon this ear than upon the other. The Eustachian tube is minute as compared with the external auditory canal, and can only admit a fraction of the volume of air that the latter holds. And, therefore, I do not mean to affirm that my experience of speaking into my own Eustachian tube is so stunning as what happens when another person speaks into the external one with his lips applied to the auricle. Yet, the illustration is so correct that, with a due allowance for the difference pointed out, it will convey a fair idea of the nature of the shock. Inspiratory sounds are also heard through the tube, but then only in a very faint manner."

^{1.} Italicizied by the Author.

On page 185 he relates a case similar to his own:

"About a dozen years ago a young woman, a member of a church choir, with only a very slight appearance of faucial relaxation, and a slight elongated uvula, with no other sign of ill health than a slight anæmic look, narrated symptoms essentially like those before us." * * * * * "She had, herself discovered and practiced the mode of reducing her bulging outward membrana tympani by trying to breathe with shut nose and mouth." 1 (4th, 5th and 6th Cons.)

^{1.} Italicized by the Author.

CHAPTER XXVII.

THE METHOD OF AIR-SUPPLY TO THE MIDDLE EAR;
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[CONTINUED].

In this chapter I propose to give a few experiments on the healthy ear, that will give additional proof that the "deglutition method" is not founded on facts. I do this both to show the rich resources that I have to corroborate the correctness of my view, and because some have said that I have taken pathological Eustachian tubes, to show their normal action, a seemingly defective method of getting proof. That the pathological condition of the tubes of those patients did not cause the phenomena described—aside from causing the patency—and that the patency alone did produce these phenomena, is proved by the fact that on the instant that the tubes were closed, even before the inflammation that caused the patency

^{1.} Since the publication of the article on the Eustachian lube, in the St. Louis Medical and Surgical Journal for July 20th, 1880, I have received quite a number of communications from physicians, mostly from the East, all but one agreeing that I had proved the correctness of my Seven Conclusions. This one, rather unphilosophically, I think, stated that "It is not possible to prove the physiological function of an organ by its action while in an abnormal state." The criticism has been anticipated long ago.

had subsided, the whole train of phenomena as instantly disappeared, remaining away while the tubes remained closed. The patient's inability to keep the tubes permanently closed caused them to seek the assistance of a physician, otherwise they would not have complained of their hearing. This effectually answers this adverse criticism.

EXPERIMENTS.

It is universally accepted as true, that the act of deglutition, in immediately removing the prominent symptoms, and the main disability to the hearing, occasioned by the inflation of the middle ear, is proof that the Eustachian tube was opened into the cavity, and that the restoration of the usual degree of hearing is complete. This has been accepted unquestioned, but if the hearing had been tested by exact measurement during the experiment, a very great error would have been diacovered.

The logic of the profession runs thus: "Yes, the act of deglutition, as Toynbee said, opens the Eustachian tube all the way into the middle car, so that air can freely enter or recede, therefore, the air density in the cavity is equal with the surrounding atmosphere; this is known from the fact that when the ear is either inflated or air is abstracted from it—the effect of which is to cause a disagreeable sensation and a deafness—the act of swallowing relieves both symptoms."

I am satisfied that if this experiment had been thoroughly tested, the functions of the Eustachian

tube would have been discovered long ago. This error not only led to the deception of observers, but caused them to make other errors, as for instance, considering the tube as a means for draining the middle ear.

The following method of making this experiment, with a normal ear, will prove the correctness of what I have said:

First Experiment.—First, attach one end of a long thread to a watch, retaining the other extremity in the hand; then find the utmost hearing distance from the watch (as in the usual method for testing the hearing), placing the taut thread up to the nose. The length of this thread, from the nose to the watch, being the normal hearing distance from the watch. Second, now inflate the tympanic cavity by the Valsalvian method, then immediately perform the act of deglutition, and instantly note the hearing distance from the watch on the thread. The distance will be found to be a little less than it was before the inflation, only returning again to the usual hearing distance after the lapse of a short period of time.

The following are the reports of a few of my friends, who tried this experiment at my request:

"Feb. 9th, 1868.—I heard the watch nearly twelve feet. I then blowed my breath in my ears, producing a great fulness. After I swallowed some saliva, this left me entirely; but I had to step half a step nearer the watch to hear it, and in a few minutes, not more than two or three, I heard it again better than before.

"James E."

"July 29th, 1872.—After repeated efforts, I overcame the desire to swallow a second time, and found that the usual hearing returned in from three to five minutes after the first act of swallowing. If I swallowed two times, it returned sooner; even if I swallowed as often as I desired, I was still compelled to wait certainly over half a minute for the usual hearing to return.

"J. C. W., Lebanon, Ill."

"Aug. 6th, 1872.—(Watch covered). Inflated my ears, and immeditely swallowed twice, and heard at second knot (14% inches), natural, in 26 seconds [23 inches]. "Rev. E. A. H., Collinsville, Ill."

This shortening of the hearing distance demonstrates that the air did not all escape from the cavity during the act of deglutition (1st and 2d Cons.). If the Eustachian tube was opened all the way into the middle ear, the air within and without the tympanum would have been instantly equalized, allowing the membrana tympani as instantly to resume its normal position for as perfect hearing as there was before the inflation. Evidently there was a small portion of the tube that was not opened by the action of the tensor and lavator palati muscles, and, that the part or portion of the tube that was not opened, offered so little resistance to the passage of the super-abundant air contained in the cavity, that the tensor tympani muscle, assisted by the natural resilience of the membrana tympani, was able to force out a sufficient quantity of this air to relieve the ear of the prominent symptoms occasioned by its presence; still leaving too much air in there for the usual hearing to return, compelling the experimenter to wait a short time for the mucous membrane of the middle ear and mastoid cells to absorb the remaining or super-abundant portion (that the act of deglutition could not give opportunity to escape), which allowed the membrana tympani to become more flat than normal. After waiting for the consummation of this rarefying process the usual degree of hearing returned.

I will now make a few extracts from recognized authorities, with the view of bringing prominently before the mind, that it is a requisite of normal hearing that there should be a uniformity of air density in the tympanic cavity; and by the same authorities, and by experiments, and cited cases, I will show that there is a continual absorption of air in the cavity, and, consequently, there must be a correspondingly uniform supply of air to the cavity (3d Con.).

In the quotations, I wish the following points to be kept prominently in view: First, the assumed necessity of uniformity of air density in the cavity for the normal hearing. Second, the necessity for a method of supply to maintain this uniformity; therefore, the problem presented by them for solution is this: how can these two imperative necessities be maintained at the same time? Toynbee, Tröltsch, Roosa and others affirming that this is done by the action of certain muscles, opening the Eustachian tube all the way into the cavity during the act of deglutition.

Toynbee, on page 192, in explaining his method of maintaining a uniform air density in the tympanum, says: "During the few moments that the faucial muscles are brought into play in the process of deglutition, air can either enter or recede from the tympanic cavity, and thus be always of the same density as the outer air." On page 193 he gives his reasons why a constant supply of air is necessary saying: "Although from the preceding remarks there can remain little doubt that the faucial orifice of the Eustachian tube is ordinarily closed, except during the act of deglutition, it is requisite to perfect hearing that the tube should be pervious, and that there should be a constant interchange of air in the cavity of the tympanum. If the Eustachian tube becomes impervious, the air that was in the tympanum at the time of the closure gradually disappears. It is not easy to decide whether it is absorbed, or whether by a kind of exosmose it passes through the membrana tympani; but whatever the cause, in a space of time varying in different cases from a few hours to a day or two, there is no doubt the air in the tympanic cavity becomes partially exhausted. The effect is to produce an increased concavity in the external surface of the membrana tympani; a forcing inward of the chain of ossicles; pressure on the contents of the labyrinth; and a very serious diminution of the hearing power."

In the last edition of Tröltsch on the Ear, page 180, the author, speaking of the Eustachian tube, says: "It serves as an outlet for the secretion of the latter (the cavity), but especially as a passage for the renewal of the air in the middle ear. It is, therefore, a ventilation tube, by means of which the meeting of strata of air of equal density before and behind

the drum is made possible, and the air in the tympanum maintained of the same degree of tension as that of the external atmosphere."

Again, on page 187: "But if the tube is at the same time to be a ventilation tube, by means of which a regular exchange of air between the pharynx and the cavity of the tympanum is brought about, it is necessary that its regular and frequent gaping or opening should take place only in this wise, that the strata of air before and behind the membrana tympani be kept of the same tension and density that is requisite for a normal vibratory capacity for the drum. Experience has shown that such an opening of the tube takes place with every act of deglutition."

My effort will be to demonstrate that this mode of replenishing air to the middle ear is not so "frequent" as to admit of its being as regular or uniform as the abstraction of air from the cavity—that is to say, that the mucous membrane, in absorbing the air, is more uniform than is the act of deglutition.

It seems to me that it is superfluous to say, that there is no possibility of there being a uniform supply of air by an irregular action of an organ; yet, according to the quotations, the cavity must await upon this action for its air. Keeping in mind the constancy and rapidity of air absorption within the cavity, the longer the interval of time between the acts of deglutition that supply the air, the greater must be the variation between the internal and external air densities; therefore, good hearing must of necessity be of an intermittent character, synchronous with the

act of deglutition. The following experiment will prove that this is not the case:

Second Experiment.—Let the experimenter place a watch (with a thread attached to it and employed for the same purpose as mentioned in the First Experiment) as far from his ear as he can hear it, marking this place on the thread by a knot; let him remain in this position without performing the act of deglutition for a number of hours. It will be found that his hearing the tick of the watch at the end of two hours will be just as acute as at the beginning of the trial, and that he could hear the sound at any time he turned his attention to it.

The following are the reports of a few of my friends who attemped this experiment. (I wish to say here, that it is no easy task to sit for several hours under prohibition not to swallow, as the mere knowledge that one should not swallow, intensifies the desire to do so.)

"Jan. 10th, 1868.—I commenced to listen to the tick of father's watch at 3 o'clock, but was compelled to swallow before the first three minutes passed, then I did not swallow for nearly twelve minutes, then I swallowed in five minutes, the next time I did not swallow for nearly one hour, but my throat (by this time) was very dry. I heard the watch one time as well as the other.

Jennie E. D."

"Feb. 10th, 1872.—Commenced to listen to the watch (covered) at 2 o'clock P. M., and swallowed only when I was compelled to, at 2:03, 2:06, 2:26, 3:03, 3:16, 4:08, 4:25½, 4:44 and 5:37 o'clock P. M. I heard

the watch equally well all the time, but my throat was a little sore when I got done. Bella R."

"March 21st, 1872.—I made the same experiment, and swallowed at 1, 1:08, 1:46, 2:20, 4:13, 5:12, 6:27 o'clock P.M. Distance just six feet. I heard the watch this time also as well at one time as another. My throat was not affected in the least. Bella R."

"April 8th, 1872.—Commenced to listen at 9 A. M., and did not swallow, because my throat was very sore (occasioned by tonsillitis), until 11:30 A. M., and then only because I forgot. Commenced again at 1:30 P. M., and did not swallow for just three hours. My hearing was not very good when I started, but was equally good at any time I listened to the tick of the watch.

H. Lee J."

Jan. 1880.—I had no difficulty in making the experimet you desired, as my throat was so very sore that I would not have swallowed for fifty dollars. (He suffered from a severe attack of acute tonsillitis). After having my throat sprayed at 7 A. M., I swallowed some milk; I did not swallow again until at 3 P. M. of the same day. While I had severe pain in my left ear especially, my hearing in this ear was equally good before and after swallowing. My watch was heard at about 47 inches all the time.

G.—

It is certain that in the intervals between the act of swallowing there could not have been as uniform a supply of air to the tympanum, if the act of deglutition was the only means of air supply, as there must have been a uniform absorption of air within the cavity, and yet the hearing was just as acute after this long non-performance of the act that Toynbee, Tröltsch and others allow for the renewal of air to the cavity, as before the experiment, when they swallowed as often as they desired.

The result of this experiment proves one of two things, viz: That either there was no rarefaction of air within these tympana by absorption, or that the supply of air to the cavities must have permeated the Eustachian tubes as continuously as it was requisite to maintain the normal tympanic air density. As air absorption by the cavity is a known fact, it follows that my third conclusion is correct.

Every case of that numerous class known as "Obstructed Eustachian Tube," caused by chronic inflammation of the mucous membrane lining it, will bear the same evidence as this experiment and the first one-viz: that at the act of deglutition, the Eustachian tube is not opened into the tympanum, yet the degree of their hearing proves that the air slowly and continuously permeates through the abnormally closed tubes into the middle ear, although not sufficiently rapid for good hearing. That there is air permeation in this condition of the tube, in all such cases of this class, is evident, because of the degree of hearing being much greater, and the concavity of the membrana tympani much less, than in patients suffering acute tubal catarih, where little or no air can enter, because of excess of secretion. If air does not enter the cavity at all, then the deafness would be as great as in any case of complete closure of the tube, and the concavity of the membrana tym-

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any action of the tensor and levator palati muscles to open this passage to the middle ear for the normal renewal of air.

Third Experiment.—First find the utmost hearing distance from the watch, with the aid of the thread, as before stated; note this. Second, close the nostrils with the thumb and forefinger, and perform the act of deglutition several times, thus abstracting the air from the middle ear, so as to decrease the hearing as much as possible; immediately after this again find the hearing distance from the watch, and note this on the thread; continue every five minutes to make observations of the hearing distance for a period of half an hour, all this time refraining from performing the act of deglutition. It will be found that the hearing distance from the watch will continuously increase, although there has been no act to open the Eustachian tube.

The following shows the result of this experiment made by two of my friends:

"COLLINSVILLE, ILL., April 24th, 1872.—Found the normal hearing (watch covered) at length of this (shorter) string (48 inches) at 9 A. M.; swallowed with nose closed and heard at first loop (38½ inches) at 9:04 at original distance. Swallow and heard at same. Repeated several times.

Rev. E. A H."

"ST. Louis, April 24th, 1872.—First found distance (645 inches) that I heard the watch, then I cut the cord, closed my nose and swallowed:

12:45	P. M.,	and	heard	at :	1st	knot	(481	inches.)
12:50	"	"	"		2d	46	(60\$	"
12:52	"	44	"	full	ler	ngth	(643	"
trial	At 8:3	5 P. M	., hear	dat !	1st l	knot	(498	"
At	8:40	46	"		2d	22	(543	"
At	8:45	46	"		3d	66	(615	"
At	8:50	46	66		4th	"	(627	"
At	8:65	66	46		5th	66	(67	46
At	8:57	66 B	ame as	s at t	the	start	(691	46
400								

AMELIA F.

(Teacher in one of the Public Schools.)

Evidently, the cause of this increase of hearing tance from the watch, under these circumstances, due to the tympanum being again replenished th air, so as to allow the membrana tympani to urn to its normal position. But how did this get into the cavity?—by what avenue? I take hat this is as conclusive evidence as could be refred to prove air permeation through the normally sed Eustachian tube (3d Con.).

Although the celerity of the air exhaustion within a cavity is not in dispute, it is nevertheless evident, it great importance must be attached to the rapty of its disappeaarnce, when the question of its oply to the tympanum is under conideration, as we abstraction only requires slow renewal, and old abstraction an equally rapid supply. For the roose of placing this important function of the cous membrane prominently before the mind, so it due importance may be attached to the method supplying the absorption thus continually going the following experiment is given, viz.:

Fourth Experiment.—First, find the utmost hearing distance from the watch, aided by the thread in measuring as before mentioned; note this. Second, inflate the middle ear by the Valsalvian method, thus foreing, by a superabundant supply of air, the membrana tympani away from its normal position, dragging with it the ossicula auditus; immediately after this inflation (refraining from performing the act of deglutition), again note on the thread the hearing distance. Continue making these observations as to the hearing distance, every five minutes for half an hour, of course refraining from swallowing.

With those experimenters whose Eustachian tubes are normal, the inflation will decrease the hearing; and with those having an inflamed mucous membrane of this tube, thus lessening the opportunity for air to enter the middle ear, it will increase the hearing; and with those whose tubes allow an excess of airbordering on patency—it will decrease the hearing; but with either party it will be found that the usual amount of hearing will soon return. As this usual hearing could not return until the membrana tympani and ossicula auditus also returned to their usual position, it is therefore, conclusive evidence that the superabundant air was abstracted by some means, and as the act of deglutition was not performed, it must have been rapidly taken away by the action of the mucous membrane of the cavity.

The following are the results of the trial of two of my friends who made this experiment for me:

Bellevile, Ill. March, 1872.—Found the distance that I could hear from the watch, which I covered; forced my breath into my ears, holding my nostrils closed. Refrained from swallowing. Heard less, but after waiting three minutes, heard at the first distance. I repeated this five times, with the same result.

Mr. J.—

LEBANON, Mo., April, 1872.—I heard my watch 38 inches, then inflated my ears and heard it 28 inches, did not swallow, but in about two or three minutes (a long time when looking on the watch), I heard at 38 inches more distinctly than at the start. Why is this? Did not repeat it.

W. E. L.

Many others made the same experiment, and arrived at the same result, that is, the usual hearing soon returned without the act of swallowing.

From the result of this experiment it is evident that air absorption from the tympanum is not a very slow process.

We have other means of measuring the rapidity of the air absorption in this cavity. For this purpose I will relate, as briefly as is consistent with the importance of this subject, the observations made on the following patients having Eustachian tubes closed by acute tubal catarrh, viz.:

CASE XIV.—Master Freddie H., aged about nine years. Examined first on July 25th, 1866. Has suffered for about three weeks from a very severe cold in the head; his throat was also much affected; tonsils enlarged; breathed entirely through the mouth. Supposed cause, prolonged bathing. Hears the watch in both ears only on slight pressure; has considera-

ble pain in the ears, and under them, toward the throat. The membranæ tympana of both ears were very concave.

Attempted to inflate the tympanic cavities by the Politzer air douche, but failed; also failed on the 26th, but on the 28th was successful in opening the left tube, increasing the hearing in this ear to 12 inches (normal hearing distance of the watch about 96 inches).

Aug. 3d.—Hearing to-day same as before treatment; was again unsuccessful in inflating either cavity.

Aug. 4th.—His mother accompained him to-day, stating that his improved hearing of last Saturday did not last until he got home. Was again unsuccessful in inflating the tympanic cavities.

Aug. 6th.—To-day opened both tubes by the air douche. The hearing was not examined before the treatment, but this inflation increased it in the right ear to 13 inches, in the left to 15 inches.

Aug. 7th.—Watch heard with both ears only when nearly in contact. One successful air douche increased the hearing in right to 9 inches, left to 11 inches. Three other inflations to 14 inches on right side, and 17½ inches on left.

Aug. 9th.—Hearing in right 2½ inches, in left 4 inches. After inflation of middle ears by seven air douches his hearing was increased to 18 inches in right, and 22 inches in left. This was about 10:30 A. M. He did not leave the office until 12 M., when, on examination, his hearing with right ear was reduced to 7 inches, left 10 inches. Here was a loss in one and a half hours on the right side of 11 inches, on the left 12 inches. Three more douches increased the hearing to 21½ inches and 27 inches, respectively.

Aug. 10th.—To-day there was a loss in two hours of 13 inches in right, and 18 inches in left.

Aug. 11th.—Loss to-day in one and a half hours 7 inches in right, and 13½ inches in left.

About the same amount of loss of hearing followed the next four treatments; this was also noticed by father of the patient. The observation of this decrease of the hearing so soon after the treatment was first made by the mother of the patient (who was a teacher in one of our public schools); and it was her remarks about it, that were the cause of its being noted by me.

CASE, XV.—The next case in which I took notice of the degree of hearing lost after treatment, was my niece, Miss Lizzie I. R., aged ten years. tonsils were very much enlarged. Hearing watch with right ear, contact, left, 1 inch. The first inflation caused a very loud crack in her ears, frightening her very much. After this air douche she heard the watch with the right ear 18 inches, left, 32 inches. I tried for about half of an hour to pursuade her to allow me to make another application of the air douche, but in vain. Her hearing at this time was reduced 111 inches on the right side, and 19 inches on left, a loss during this half hour of 61 inches in right, and 13 inches in left. Four days afterward-March 9th, 1867-her hearing on right side was, contact, left, 13 inches; after one air douche, right ear 17 inches, left 35 inches, after another, right 22 inches, left 46 inches; then was compelled, on account of the very great dread of the effect of noise that the inflation caused, to desist until 2 P. M., when her father came to my assistance. After she had been away nearly four hours, her hearing had decreased to 12 inches on right side, and 27 inches on left, a loss in this time of 10 inches on right, and 19 on left.

The history of quite a number of similar cases could be added, demonstrating the rapidity of the absorption of air within the cavity of the tympanum.

If the "deglutition method" of renewing air to the tympanum is correct, the experimenter that refrained from performing the act of deglutition for two hours, must have been as deaf as either of those cases having tubal catarrh, two hours after their treatment, for neither, according to the Toynbee theory, had any means or opportunity of supplying air to the middle ear, in the place of that abstracted by the mucous membrane of the cavity. This should have caused an equal loss of equilibrium in the tympanic air density in both individuals, consequently an equal loss of hearing; but the results prove that those having normal Eustachian tubes did not suffer loss of hearing, by reason of this so-called closure (3d Con.); whereas, those cases having abnormally closed Eustachian tubes, did seriously suffer loss of their hearing, even after a much shorter period of closure.

The Fourth Experiment, and the observations made on cases XIV and XV, prove that even if the act that is claimed to open the Eustachian tube was performed every minute during life, it would not

^{1.} I have observed the hearing decreased in like cases at the rate of from 13 inches in two hours to 16 inches in five minutes.

be sufficiently "frequent" to maintain the requisite uniformity of air density in the cavity to admit perfectly uniform hearing. A continuous air absorption necessitates a continuous renewal. Either you must stop the continuous abstraction, or you must allow the continuous supply. The alternative is physically unavoidable.

Again, I deem it self-evident that a uniform tympanic air density implies that there must be a uniform condition of the Eustachian tube; therefore, this passage must be uniformly open, or uniformly closed. It is impossible that it can be closed the larger part of the time, and open at accidental intervals, and there exists at the same time a uniform air density in the tympanic cavity while air absorption is continuous. Now, if the walls of the Eustachian tube are constantly in contact, or only in contact during the interval between the acts of deglutition, in what condition will the air that remains in the cavity be in respect to its density, as compared with that on the outside? Most certainly it will soon be in a rarefied condition (4th Con.), unless it can as freely and continually enter the cavity as if it had an open tube to admit it. Even if the "deglutition method" of tympanic ventilation is correct, much the greater period of time, this air in the cavity must be in a rarefied condition, as the absorption is rapid enough to produce this effect upon it, and the act of deglutition is not made sufficiently frequent to prevent it. From this it appears as

though there would be a necessity for a patency of the Eustachian tube—that is, if the normal air density in the middle ear must—as asserted by Toynbee, Tröltsch and others—be maintained equal to that of the surrounding atmosphere; but instead of this, there is, in my opinion, a physical necessity for a rarefied condition of the air density in the middle ear, even if the Eustachian tube was only closed for a short period of time, to allow the oscillations of the membrana tympani to move with greater freedom, and to prevent undue condensation of air in the tympanum by the vibrations of the membrane, occasioned by the waves of sound.

THE FUNCTIONS OF THE MASTOID CELLS.

Mr. Toynbee, in his work on the Ear, 1868, page 300, says: "As regards their functions, the mastoid cells may be considered merely in the light of an appendage to the tympanic cavity; but their conformation and intimate relations with the lateral sinues render a special study of their diseases necessary, previous to entering on which it is, however, important thoroughly to understand their anatomical relations."

It is seen that Toynbee has no use for the cells, and would have had less practice where they entirely absent, consequently the patient would be better off without them.

Tröltsch, 1869, page 336, says: "It is a generally accepted opinion that the purpose of these air cells, this porous structure, is to give this firm support of the soft parts a certain lightness. But there must be

some further purpose than this. The air cells of the mastoid process increases the quantity of air in the ear, which is set in motion by means of the acoustic vibrations. They are with every circumscribed fixed body, and every circumscribed quantity of air in the vicinity of the labyrinth, to be compared to a resonator, or sounding board."

Dr. Peter Allen, of London, 1871, on page 161, of his work on the Ear, says" With regard to function, the mastoid cells may be considered as an amplification of the tympanum, or an appendage to that cavity. It seems to be an accepted opinion that this porous light, yet firm and stable cellular structure acts as a sort of reservoir for air to the drum, with which the cells freely communicate. Being placed immediately opposite to the entrance of the Eustachian tube, air easily passes into the mastoid cells, and is set in motion by acoustic vibrations impinging upon the membrana tympani. And when that membrane is extensively perforated or lost through disease, the air contained in this amalgamated cavity is influenced greatly by the sonorous impulses from without. By bearing the last-mentioned circumstances in mind, you will understand how an excellent degree of hearing may be attained, even under such deficiency when the little plug of cotton wool (Yearsley's artificial tympanum) is inserted against the ossicles, or sometimes against the stapes, if that be the only one remaining."

Much the greater majority of aurists fully describe the mastoid cells, but do not give us a line as to their functions. And from the views of the three that I have given, they believe that the patient would not be the looser were there no such cavities in the head. Allen's theory, which he has borrowed from Tröltsch without credit, is not consistent with good reasoning, for although the cotton artificial tympanum increased the hearing, it only does so when it makes slight pressure on one of the small bones of the ear, and it could have had this effect even if the mastoid cells were entirely absent, or were a pint in capacity. That it was requisite to have the ball of cotton push the ossicles slightly inward, only shows that the normal condition of the liquid in the internal ear is that it should be under slight pressure, as stated in my 7th Conclusion.

The fact that the openings between the middle ear and the mastoid cells are situated so high that they cannot be used as an avenue for drainage, any more than can the Eustachian tube be made an avenue for drainage for the tympanum, shows that their functions have not been understood by those who state that these openings are a means of drainage.

It is a well known fact that the healthy mucous membrane never secretes more mucus than is required to moisten its surface. Now, what is there to be drained off? Is any one so short sited as to say that these openings were made in anticipation of a diseased condition of these cavities? That would only equal the absurd suggestion of a London specialist, who said that the function of the uvula was to conduct the secretions from the pharyngo-nasal cavity to the tongue, and thus prevent them from dropping into the larynx!

When we remember that the patient who is afflicted

with a patent Eustachian tube, is defective in hearing, and that this defect is owing solely to the fact that the air in the middle ear is equal in density to the surrounding atmosphere, and that when the air in the middle ear is made slightly rarefied, so that it causes the membrane to recede inward and thus make slight pressure on the internal ear, the patient instanly improves in hearing; when we remember that the mastoid cells are so formed that their walls are amplified, and thus provide a large surface to be covered with mucous membrane; when we remember that all mucous membrane absorbs air; when we remember the portion of the tensor tympani that is in the middle ear, as well as the stapidius muscle, are both encased in hard bone, so as to prevent their enlarged condition-which takes place on every contraction-from affecting the density of the air in the middle ear; when we remember that the membrana tympani and ossicula auditus will vibrate more freely in a rarefied air than in an atmosphere, which if equal in density to the surrounding atmosphere, must necessarily be made more dense at every inward movement of the membrane, we can easily see that the functions of the mastoid cells are first to provide room in which there is sufficient air, so that the condensation made by the inward movement of the drum head will not prevent its free motion, and second, to provide sufficient surface on which to place mucous membrane that will abstract just the right quantity of air for the rarefaction just mentioned.

RESUME.

The First Conclusion-"That during the act of deglutition the Eustachian tube is not an open passage into the tympanum"—has been sustained by the fact that the increased concavity of the membranæ tympana of those patients that recover from the disability of their hearing occasioned by the patency of their Eustachian tubes, as compared with its curvature before their recovery. We have seen that after their hearing has been permanently increased, the act of deglutition does not cause their membranæ tympana to become less concave, as it did before their recovery. Now, as we know that they increased the concavity of their membrane by abstracting air from the middle ear, and as the closure of the tube was necessary to maintain this concavity, it is evident that if the act of deglutition opened the tube, this maintained curvature would be instantly released, allowing the membrane to become less concave, consequently give rise to the well-marked phenomena of patency, as it did in Mr. Toynbee's first case, and my second.1

The First Experiment (also Mr. Toynbee's first, page 190,) demonstrates that the Eustachian tube is not completely opened during the act of deglutition, but only so much of it as to make it possible for the natural resiliency of the membrana tympani, assisted by the traction of the tensor tympani, to force out

^{1.} See pages 282 and 283,

sufficient of the superabundant air that occasioned the prominent symptoms that follow filling the middle ear by the Valsalvian method, still leaving too much air in the cavity for the membrane to resume its normal position, so that the usual hearing may return, as proved by exact measurement, aided by a thread, compelling the experimenter to wait a short time for the mucous membrane of the tympanum and the mastoid cells to exhaust the remaining excess of air. After the consummation of this rarefying process the usual degree of hearing returned.

Every case, whose hearing is limited on account of chronic inflammation of the mucous membrane of the Eustachian tube, will bear the same evidence. If the act of deglutition opened their Eustachian tubes, why does it not increase their hearing as instantly as does the Politzer air douche? That they require this inflation to increase their hearing, is the strongest proof that air did not enter the tympanic cavity during the action of tensor and levator palati muscles. Yet if these same patients inflate their middle ears by the Valsalvian method, the act of deglutition, as with other patients, relieves the middle ear of part of the excess of air. It cannot be admitted that the action of these muscles allow any air to enter the middle ear; if this was the case, then frequent acts of deglutition would make the air douche needless, and the continued exercise of this faculty would increase the hearing, until the one-sided pressure on the membrana tympani was neutralized, and its normal position attained. Nor would it be correct to assert that their middle ears did not receive any air, as this would cause them to be as deaf as cases afflicted with acute tubal catarrh.

The Second Conclusion—"That the walls of the Enstachian tube are constantly in slight contact"—is substantiated by the uniform constancy of the concavity of the membrane tympana of those cases of patency of the Eustachian tube after their recovery. It is evident that the increased concavity of their membrane tympana was concomitant with their increased hearing, and that the increased curvature was caused solely by air abstraction, and this rarefaction could not in this way affect the membrane with an open tube. The continuance of the increased concavity proves a constantly limited opportunity for the air to pass through the Eustachian passage.

The failure of the return of the usual degree of of acuteness of hearing, after the act of deglutition relieved the symptoms occasioned by inflation of the middle ear, as shown by the First Experiment also proves that the entire length of the Eustachian tube was not opened by the action of the tensor and levator palati muscles.

The Third Conclusion—"That the air continuously permeates the Eustachian tube into the tympanum,

^{1.} I do not mean that the Eustachian tube in its entire length is in slight contact—as the greater part is so constructed that it forms a capilliary opening—but a portion of the tube about 4" is in slight contact.

thus maintaining a uniform air density "—is proved by the continuance of uniform hearing in every normal ear. It is well known that there is a continuous absorption of air in the tympanum which must be renewed; it follows that the supply must be, and is as uniform as is the uniformity of the concavity of the membrana tympani; but if the supply is infrequent and irregular, the shock of its entrance would suddenly affect the membrana tympani, consequently the hearing also. Therefore this mode of renewing air to the middle ear would give rise to an irregularity in hearing, which is not in accordance with our observations.

That the air does permeate the Eustachian tube, is shown by the Second Experiment-that of refraining from performing the act of deglutition for two hours without affecting the acuteness of hearing in the least degree. Whence did this experimenter receive a uniform supply of air to maintain this uniform hearing? If we will compare this result with the facts observed in Cases XIV and XV, that had abnormally closed Eustachian tubes because of acute tubal catarrh, whose loss of hearing, one and a half hours after inflation of middle ears, were 12" and 13" respectively, we will find in the contrast another evidence of the truth of this Conclusion. It is apparent that the Eustachian tubes of the experimenter-in the Second Experiment-and those of the patients just mentioned, were what is usually understood as closed, consequently they were equally circumstanced as to their opportunity for renewing the air in their

middle ears; but the results prove that the experimenter, having normal tubes, did not have his hearing affected in the least by this long so-called closure, but those having abnormally closed tubes were seriously affected in their hearing after a shorter lapse of time.

That the air can permeate the Eustachian tube even faster than is necessary for the normal supply of the tympanum, is proved by the Third Experment—namely, that of abstracting air from the middle ear by performing the act of deglutition while the nostrils are closed, then refraining from swallowing during the experiment, thus decreasing the hearing. It will be found that the hearing will return to its usual degree of acuteness in a few moments. There can be no doubt, but that the cause of this increase of hearing, under these circumstances, is due to the tympanic cavity being again replenished with the normal amount of air, even more rapidly than is requisite for the normal supply to this cavity.

With the normal ear, hearing depends upon the impingement, reception and transmission of the sound waves by the membrana tympani, via the ossicula auditus, and the liquid in the internal ear to the auditory nerve. To allow a uniform transmission of the sonorous undulation to the auditory nerve, the membrana tympani must be in a uniform degree of tension. The relation between the tension of this membrane, and its normal vibratory capacity, is as much governed by physical laws as is the tension of a piano string to give forth one uniform tone, or the con-

vexity of a lense to converge a focus at a given point; neither of the three will allow of any deviation, and at the same time be perfect in its working operations. Yet we are asked to believe that this indispensable, uniform condition of the membrane can be maintained by an irregular act.

A continuous air abstraction necessitates a continuous renewal; either you must check the continuous exhaustion or you must allow a continuous supply.

The alternative is physically unavoidable.

For this uniform tension it is essential that the air in contact with the internal surface of the membrane bear a constantly uniform relation as to density to that on its external surface, as every slight variation of the internal air density instantly affects the position, consequently the tension of this very mobile organ. It follows that there must be one uniform condition of the Eustachian tube, or this imperative constancy of air density in the cavity, and tension of the membrana tympani is impossible.

The Fourth Conclusion—"That the air in the normal tympanic cavity is not of equal density with that on the outside, the air in the tympanum being rarefied"—is proved by the observation that there is increased concavity of the membranæ tympana of those cases of patency of the Eustachian passage that improved in their hearing. We have seen that this increase of curvature did not take place when the air densities on both sides of the membrane were equal, and that the act that the patients performed for the

relief of their disability of hearing, abstracted air from the cavity, causing the membrane to recede inward, thereby increasing their hearing. The coexistence of these facts affirm that the air in the normal middle ear is in a rarefied condition.

The Fifth Conclusion—"That one of the functions of the Eustachian tube is the maintenance of this inequality of air density"—is sustained by the evidence of the necessity of an increased concavity of the membranæ tympana, in cases suffering from abnormally open Eustachian tubes, for increased hearing. It is evident that the rarefaction of air in the middle ear that sustains this concavity, must be maintained by a graduated and uniform entrance of the supply into the tympanum.

The Sixth Conclusion—"That the rarefied condition of the air in the tympanum is the cause of the uniform concavity of the membrana tympani,"— especially that portion from which the 'light spot' is reflected, is substantiated by the observations made of the methods that patients, afflicted with abnormally open Eustachian tubes, take to reduce their flat membranæ tympana to a more concave condition—i. e., making an inspiratory effort, or performing the act of deglutition with their nostrils closed.

The Seventh Conclusion—"That a certain degree of uniform pressure on the fluid in the internal ear by means of the membrana tympani and the small bones of the ear, is essential to normal hearing"— is sustained by the fact that inward pressure of the

membrane of those patients who recovered from patency of the Eustachian tube, increased their hearing, and that the outward movement of the membrane decreased their hearing. This conclusion is also sustained by a fact, well-known by every Aurist of even limited experience, viz.: that the artificial membrana tympani—of whatever form—must make slight pressure on one of the ossicula to have the least effect in increasing the hearing.



CHAPTER XXVIII.

CHRONIC CATARRHAL INFLAMMATION OF THE EUSTACHIAN TUBE AND MIDDLE EAR, AND ITS SEQUENCES.

PATENT OR ABNORMALLY OPEN EUSTACHIAN TUBE.

This disease is not mentioned in works on Otology. Of 812 cases of ear affections that I have treated, I have had 32 patients in whom the Eustachian tube was abnormally open, showing that it is far from being an infrequent complaint.

The immediate cause of the complaint is the lodgment of a small quantity of secretion in the lower portion of the Eustachian tube. The quantity of secretion is not so great as to completely fill the slit-shaped canal, but is sufficient to act as a wedge to hold open the upper portion, and in this way allow the too free access of air, and sounds from the larynx to the middle ear.

The continuous absorption of the air in the tympanic cavity, causes the membrana tympani to be drawn slightly inward, making its outer surface convex. To supply this air continuously and uniformly, the Eustachian tube must be uniformly permeable, the opening being merely capillary. When the mucous membrane of the tube takes on a catarrhal condition, the secretion is not formed in the upper portion of the tube, i. e., where the air is continuously entering, as in this location there are no mucous glands ! glands

are found in that portion only of the slit whose sides are in constant apposition; consequently when a superabundant quantity of mucus is poured out, as in the catarrhal condition, it must first fill the lower portion of the tube; it thus holds the parts above the location of the glands open for the entrance of sound from the larynx, and the too free entrance of air, to the disability and annoyance of the patient.

The normal membrana tympani is more or less concave from the slight rarefaction of the air in the middle ear, but so soon as the Eustachian tube is compelled to remain open, so that air freely enters, then the membrane on that instant falls outward, dragging with it the ossicula, which interferes with normal hearing.

While deafness is a prominent symptom of the patent tube, the most annoying symptom, is the unusually loud sound of their voice in the ear. It so completely confuses some patients that they will instantly discontinue their conversation to take their handkerchief to blow their nose, in the endeavor to relieve themselves of this tormenting sensation. In a short time they learn some method of getting momentary relief, such as closing their nostrils and making inhaling efforts, as in case X, page 282; trying to inflate their ears from their lungs; swallowing saliva while they hold their nostril closed, etc. These methods greatly rarefy the air in the pharyngo-nasal cavity, Eustachian tubes and middle ears, and for a moment close the Eustachian tubes, which shuts off the

sounds from the throat and cause the membrana tympani to again assume its normal concavity, thus increasing the ability to hear.

It will at once be seen that this complaint belongs almost exclusively to the middle age, and that it comes on only after a long continued chronic catarrhal inflammation of the pharyngo-nasal cavity. Patency of the tube will hardly happen with the young, as their secretions are so very profuse that they will at once completely fill the tube and thus completely shut off all access of the air to the middle ear. I have not seen a patient over 55 years old afflicted with patency of the tube. I think that it will rarely affect them, for the reason that their secretions are not profuse enough to form a wedge to hold the tube open.

The most annoying symptom is the sound of their own voice. To some their voice sounds, as though their head were in a barrel; to some, their voice has an echo to it. Some hear two sounds to their own voice, one from within the mouth or head, the other far off, to one side. These two sounds are easily explained: one, the loud sound, comes from the throat and enters the Eustachian tube and goes at once to the ear by a short cut, the other sound goes to the ear after it has left the mouth; this is the indistinct and distant sound.

TREATMENT.

As the patent tube is caused by pharyngo-nasal catarrh, the local treatment will be mostly confined to this complaint. The spray produces Nos. 3, 4, 5 and 2, used as they are named here, should be employed, spraying the vaseline and pinus comp, as for pharyngo nasal catarrh. After this is done, the Eustachian tube should be frequently inflated by Gruber's method, if possible; if not by this method, then by Politzer's method. In the former method, the air is compressed while the patient phonates the word "hick" strongly, the latter while he is in the act of swallowing a little water, as described on pp. 215 and 220.

After the secretions in the pharyngo-nasal cavity have lost their purulent character, electricity will frequently be of great benefit to some patients, using an intensity that will be slightly felt by the patient.

It will always be observed that as the inflammation of the pharnygo-nasal cavity is reduced, so does the symptoms connected with the Eustachian tubes subside. A failure in the treatment of the primary location of the complaint, will result in the failure to ameliorate the secondary symptoms.

The frequency of treatment, and the length of time required, will depend, as it does in pharyngonasal catarrh, on the severity of the case. (See cases farther on.) CHRONIC CATARRH OF THE EUSTACHIAN TUBE AND MIDDLE EAR.

The most prominent symptom connected with chronic catarrh of this part of the head, is deafness. It is mainly on account of this disability that patients consult their physican.

This complaint is always preceded by a long existing pharyngo-nasal catarrh, which must receive the principal share of the attention and treatment, and, as is the result of the treatment of this disease, so is the success of the treatment of the case.

The first thing to be done is the employment of the spray producers Nos. 3, 4, 5 and 2, used as named, as in pharyngo-nasal catarrh. This should be repeated every day for a few days, then every other day for three or four weeks, then twice a week for two or three weeks, and once a week for three or four weeks, at the same time prescribing constitutional treatment, giving a laxative, diuretic and tonic.

Inflation of the middle ears should follow the use of the spray producers as described on pp. 215 and 220. Should the inflation precede the use of the spray producers, the mucus in the neighborhood of the mouths of the Eustachian tubes might be blown into these passages to the detriment of the patient's hearing. (See cases farther on.)

THE TUNING FORK AS A MEANS FOR DIAGNOSING PERFORATIONS OF THE MEMBRANA TYMPANI.

In April, 1869, I suffered rupture of the tympanic membrane of the right ear, caused by a loud explosion, which occurred in making oxygen gas, using, by mistake, sulphuret of antimony, instead of peroxide of manganese.

By this accident I became acquainted with a valuable means by which to diagnose rupture of the membrana tympani.

In aural examinations I had frequently applied the tuning fork to my own head, when instructing my patients to observe the variations of the sound of the tuning fork, that are made while the auditory canal remains open or is closed. While repeating this application on myself, after the rupture of my membrana tympani, I was surprised to find that after closure of the auditory meatus of my right ear, by pressure with my finger on the tragus, I could not detect the usual variation in the sound of the fork, that I had so frequently heard previous to my injury. I then tried the effect of closing my left ear. From this ear the usual variation was heard.

Every week since that time I have had opportunities of testing this means of detecting perforation, and I have not had a single patient on whom it did not point out the condition of the membrana tympani, that is, whether it was perforated or imperforated.

In each of four cases of traumatic perforation, closure of the meatus of the injured ear, had no effect on the sound of the fork, but so soon as the wound healed, the sound was increased, equal to the volume of the increase heard in the uninjured ear. (See cases farther on.)

OTORRHŒA.

There are two very good reasons for the general failure to successfully treat this complaint; one, is the difficulty to get the parents of the child to properly attend to cleansing the ear; the other, is because this complaint has been deemed an idiopathic disease, and not a sequence of a pharyngo-nasal inflammation.

This complaint, as well as the diseases affecting the eye, has for many years been erroneously diagnosed and treated by oculists and aurists as idiopathic diseases, when in reality almost if not every non-traumatic affection of both of these organs may be found to be consequences of chronic inflammation of the nasal and pharyngo-nasal cavities and the sinus connected with them. ¹

This is sufficient to indicate the course of treatment that I should choose to take, namely, that the nasal passages require much more attention than does the diseased arral cavity.

The first thing to be done, is to cleanse the ear with

^{1.} Some may say that I have taken a good deal of pains to go out of my road to make an expression that will draw some severe criticisms. My reply is, I am writing for the critics of 1890. (See Dr. Dickinson's and other eye cases.)

the Aural Douche, as described on page 107, Figs. 8 to 16 inclusive. The child's parents should be instructed how and when the cleansing should be attended to and when it should be discontinued. Of course, if the patient is an adult, the instructions given to him will be the same.

Second, the pharynx and nasal passages should be thoroughly sprayed by the spray producers Nos. 3, 4, 5 and 2, using half a dram of vaseline alone in the latter instrument, and half a dram of vaseline and three drops of the pinus comp. in the former three, warming the remedies after they are placed in the spray producer.

Third, the Eustachian tube should now be inflated while the patient is pronouncing the word "hick," as described on pages 215 and 220. Inflation may also be performed while the Warm Spray Producer is throwing vaseline spray into one of the nostrils, as described on page 205, Fig. 30, while the other nostril is closed and the patient is either directed to swallow a little water or to say "hick," the latter method having much the greater effect on the ear. It should be constantly borne in mind that not the least pain or even disagreeable sensation should be produced by the treatment.

The number of treatments will depend greatly on the severity of the complaint and on the color of the hair and skin of the patient. Dark haired patients usually heal quicker than those having light hair. Usually a treatment once a day for four or five days, then every

other day for about three weeks, then twice each week for the same length of time, and once a week for about as long a time, results in recovery.

One or two treatments a week for three or four weeks each fall and spring for a few years usually results in a complete cure; provided care is taken to prevent unnecessary exposures to cold and sudden changes of the weather.

INSPISSATED CERUMEN.

A constipated condition of the cerumenous glands is the cause of the cerumen being so hard that it, in turn, causes impaction of the cerumen in the external auditory canal. Instead of these glands secreting cerumen of the normal consistency—which is soft enough to be moved out of the auditory canal by the motions of the vibrissæ of the ear during the motions of the jaw—they secrete a cerumen that is in such a hardened condition, that the vibrissæ cannot remove it. The cause of the cerumenous glands secreting this hardened ear-wax is an abnormal heat of the auditory canal, which in turn is caused by inflammation in the middle ear, Eustachian tube, pharyngo-nasal cavity and the nasal passages, where it first originated.

Frequently the plug of cerumen will so completely fill the canal that the hearing is decreased from $\frac{24}{96}$ to $\frac{\circ}{96}$, or it may press upon the membrana tympani, and cause a sensation of vertigo.

^{1.} c, Contact of a watch to the ear, that may be heard 96 inches by a normal ear.

The removal of the cerumen is not a difficult task, yet I have the history of seven patients whose ears were permanently injured by injudicious efforts at "gouging out" the hardened mass. I should be tempted to say that the man who uses an ear-gouge to remove inspissated cerumen is a bungler.

Instead of employing the usual ear syringe, I have had constructed a slim injector Fig. 37 that has a recurrent flow. The instrument is bent upon itself so that

Fig. 37.

Small Ear Injector, full size.

when passed into the ear, the hand that holds it does not obscure the view into the canal. There is nearly always a small portion of the upper and forward part of the canal that is not closed by the wax; through this, the slim injector may be passed to quite near the membrana tympani and in this way the stream of warm water is thrown, not directly against the membrana tympani, but out from the sides of the instrument and directly behind the mass of cerumen. As the stream flows slightly toward the outer portion of

the auditory canal, it will flow the detached and softened mass out of the ear. It is seen that this is an excellent instrument to flow or wash foreign bodies out of the ear, as the stream may be placed behind the substance, provided it does not completely fill the canal, and thus strike it from behind.

After the ear has been cleansed, a small piece of cotton, upon which a little vaseline has been spread, should be warmed and placed in the ear.

TINNITUS AURIUM.

This symptom of chronic catarrhal inflammation of the mucous membrane of the ear, is a paralysis agitans of one or more of the muscles connected with the small bones of the ear.

There is no such a thing as a sound. It is only the impression that the vibrations of the air, or other body, make on the auditory nerve by means of the liquid in the internal ear. That is, it requires motion or impression made by motion to cause us to perceive the so-called sound waves. Therefore, we cannot have any kind of a sound in the ear without motion being imparted to the liquid in the internal ear. Now, in tinnitus aurium we have sound that is not produced by sound waves in the air, yet this sound must and can only be produced by motion imparted to the liquid in the internal ear, and this motion, I think, is imparted by a paralysis agitans of one or more of the small muscles belonging to the middle ear. The alternate contraction and

relaxation of the muscle or muscles causes the motion, which is imparted to the ossicula to which the muscles are attached, which in turn imparted it to the internal ear.

The noise is variously described by patients as resembling the sound of the escape of steam; the puffing of a steamboat; the rushing of water from a mill-gate; the ringing of bells at a distance; the tink-ling of metal; the intermittent noise heard in the elevator of a hotel; the sound of the propeller of an ocean vessel; the intermittent noise of a steamboat's paddles; pattering of fine drops of rain on a shingle roof; the rumbling of railroad car wheels; the working of a printing press, etc. Very frequently there are two or more distinct sounds in the ear at the same time.

These expressions of the resemblance of the noise in the ear are some that were given to me by my patients. With many of them I am certain that the noise in the ear dated from a period at which they had heard something that produced a similar sound; in most of them the noise in the ear did not commence until they heard sounds which they claim, and I think very correctly, was continued in their ears. I do not think that the patient who heard the rushing water leaving "old Jones' mill-gate" thirty years ago, would have heard this kind of sound in his ear, had he not heard the water thirty years ago. I mean by this, that the contractions of the muscle or muscles, that are affected by the paralysis agitans, cause the same

length of vibration as does the sound wave that was occasioned by the rushing water, and that the sound wave occasioned by the water was the producing cause of the vibrations of the muscle or muscles, they or their nerves being, at the same time, in a hyperæsthetic condition.

If we go into a room where there is a piano and make a sound similar to the sound that one of its strings can make, the sound that we produce will be reproduced on that string of the piano that makes the length of sound wave that our sound does. is very much like what happens in the ear. muscle or muscles connected with the ossicula being in a diseased condition, caused by the chronic inflammation in the middle ear, and ready to take on a paralysis agitans (which is a succession of contractions and relaxations), continue the vibrations from any accidental sound that exactly suits their hyperæsthetic condition. If these vibrations that were started by the accidental sound continue after the accidental sound ceases, then their vibrations constitute the paralysis agitans.

Of course the muscles were made ready by disease for the paralysis agitans before this accidental sound started it, just as the G string of the piano was ready to start its vibrations by the accidental G sound; but if the G string had not been ready, the accidental G sound would not have started it, nor would the ossicula muscles continued the "mill-gate" sound,

had not the hypheræsthesia made the muscles ready to continue it.

It is thus seen that "old Jones' mill-gate" made the sound waves that originated the vibrations of the ossicula muscles, and these muscles continued to make the same vibrations poducing the same sound.

The question may be asked would he have had this kind of tinnitus, had he not heard the sound of the water leaving the mill-gate? Most certainly not. The mill-gate sound is one that is produced by a certain rotation of peculiar vibrations. The ear muscles might have been made to vibrate by another kind of sound, but they would not have continued the vibrations, unless these vibrations came within the range of the hyperæsthetic condition of the muscles, nor could the ear muscles of themselves produce a rotation of peculiar vibrations to resemble exactly the vibrations of a particular sound, without being first started by the original sound. It follows, therefore, that it would be impossible for the patient to have the same " mill-gate" sound in his ears, had not the muscles in his ear continued to reproduce the same vibrations that produce a sound similar to the sound heard from the mill-gate.

That the vibrations of the paralysis agitans are equal in rapidity to the vibrations made by the original sound that produced it, is proved by the fact that so soon as a patient, who has a tinnitus aurium, produces a sound exactly similar to the sound in his ear, the sound in his ear ceases and only one sound is perceived. Even if the outside sound is not exactly similar to the tinnitus, the tinnitus will change its tone and become similar to the outside sound; then the tinnitus will cease to be distinguished from the outside sound, while the latter continues to be produced.

It is in this way that we effect an amelioration of tinnitus by electricity. If we can apply just the right quality and intensity of electricity that will cause a sound in the ear nearly similar to the tinnitus, and then slowly and carefully change the quantity or intensity, or both, so as to leave the oscicula muscles vibrating at a different velocity, they will frequently—not always, by any means—continue their new vibrations, which, if the inflammation is at the same time being reduced, will constitute its improvement.

I have been convinced of the correctness of these views for many years, and have had quite a number of cases that have given me positive proof that 1 am ritht. 1 will cite a few only:

Case XV1.—John H. æt. 28 years, reddish hair, recommended to me by Dr. H. S. Leffingwell, former Superintendent of our Insane Asylum, who had treated him for a throat complaint quite successfully, but the greater source of annoyance was an ever present melancholy sound in his ear.

He said that this sound alone made him uncontrollble; he felt as though he must do something to get rid of it; he would get up at night, walk the room and read, or talk so as to make a louder and a different noise to drowned the noise in his ear. Because he was doing this both day and night they thought him insane. There is no doubt but that his mind was for a time alienated. Now for the producing cause of this peculiar noise in the left ear. I give it nearly in his own words:

"One night after I had gone to bed and had been asleep for some time, I awoke very much frightened, and, trembling like a leaf, I sat up in bed. As the moon was shining bright, and the window shutters, open, I could see that there was nothing in the room to cause this overpowering terror. As I sat up in bed I groaned, but not very loud. I noticed that this,strange as it may appear to you,-drove away my terror, so I continued moaning for a short time, not loud enough for any one to hear me out of my room, and then laid down; soon I began to feel frightened again, and without sitting up in bed, moaned a short time until I went to sleep. When I was wakened next morning by my sister, she said that I was still making a low moaning sound. After she woke me up I then heard this melancholy moaning-just like what I had made the night before-in my ear. This sound remained in my ear all the time. I could not eat my breakfast, as the noise continually remind me of the fright I had in the night; and then the noise is such an overpowering, melancholy sound that it will break my heart if it is not stopped."

Case XVII.—Another patient, at a time when he had a "bad cold in the head," had occasion to visit the office of a friend, whose fireplace was closed by a piece of paper being pasted over the opening. A short portion of this paper was loose, so that the draught in the chimney caused its vibration, the sound thus made was reproduced in my patient's ear.

He was certain that he had no tinnitus in his ear when he first went into the office, and is as certain that he had it immediately after he left the office.

CASE XVIII.—Another patient stated that he was exposed for about forty hours on a wrecked ocean vessel. A part of some of the rigging made a very disagreeable noise; on being taken from the wreck, this noise continued in his ears, and was so very melancholy that sometimes he could not sleep on account of it, and that it was very suggestive of suicide as a means of relief. He had never heard any sound like it, and is certain that he got it from the wreck.

TREATMENT.—Tinnitus Aurim is very frequently successfully treated if taken soon after its commencement, especially, if the patient is under thirty-five years of age; patients over this age who have suffered from it for over five years, can be but slightly relieved.

As this symptom is but a sequence of pharyngo-nasal catarrh, this latter disease will have to be successfully treated before much amelioration can be promised to the patient. At each visit, after the employment of the spray producers Nos. 3, 4, 5 and 2, the air douche should be used. And after the reduction of the inflammation in the pharyngo-nasal cavity (known by the diminution of the purulent character of the secretions) the constant current of electricity, using just the sufficient quantity and intensity to produce a slight but pleasant impression on the patient, will frequently produce a very favorable result.

I wish to state here that no physician is prepared to apply electricity to the ears of a patient who is not well read in our late works on Electricity. The judicious application of this agent may sometimes be followed by marked benefit, while its haphazard employment is almost certain to do injury only.

The anode should be applied to the ear, the cathode to the hand of the patient that is on the side opposite to the ear to be treated. The electrode that is passed into the ear should be guarded by India rubber, except at the point. The manner of applying it, is to fill the auditory canal with pleasantly warm salt water, the patient holding the head to one side; pass the electrode into the ear to within about one quarter of an inch of the membrana tympani, then complete the connection with the battery, starting with a current so weak that the patient cannot feel it, and gradually increasing its quantity and intensity until the tinnitus ceases, lessens or changes to a more pleasant tone; 15 seconds by the watch is long enough to apply the current. In discontinuing the electricity, great care should be taken not to lose the good effect of the application by too suddenly breaking the current. The best method to avoid this, is to slowly withdraw the cathode from the open hand of the patient. If it is found that the tinnitus has been ameliorated, do not apply the electricity again at this visit. I have almost invariably found that second applications leave my patient worse than before any application was made. Be satisfied with your electricity when it has done even a little good. After your patient comes back, you will find that the good impression increased as time passed on.

Tenotomy of the tensor tympani muscle has not resulted in the benefit that was hoped for when this operation was first proposed. If it was possible to perform this operation on the stapedius muscle, it might have a beneficial effect.

CHAPTER XXIX.

THE SOFT PALATE AND UVULA—THE ELEVATOR PALATI AND THE ELEVATOR UVULÆ MUSCLES.

In November, 1876, I read a paper before the St. Louis Medical Society on the Function of the Uvula and the Prominence formed by the muscles lying on the center of the posterior surface of the soft palate. This paper was published in the St. Louis Medical and Surgical Journal for Dec., 1876. A few months after this, as I was dissecting a soft palate, I discovered that what is now called the azygos uvulæ muscles are two sets or pairs of muscles.

The upper pair, or as I have named them, the Elevator Palati Muscles, arise from the posterior edge of the nasal septum, run down the middle of the velum pendulum palati, and are inserted at about the junction of the lower third with the middle third of the velum, interlacing with the fibers of the muscles below it. The insertion occupies about one-fifth to one-sixth of the width, antero-posteriorly, of the soft palate.

The lower pair, or as I have named them, the Elevator Uvulæ Muscles, arise from the place of insertion of the elevator palati muscles—its fibers interlacing with them—pass downward, and are inserted into the connective tissue in the lower extremity of the uvula.

The action of these muscles can be seen on inspec-

tion of the open mouth with the tongue slightly depressed. On some persons the effects of their contraction are much more marked than on others. Contraction of the elevator palati rises the velum without contracting the uvula, and contraction of the elevator uvulæ raises the uvula without causing the least effect on the velum. If the same muscles ran from the nasal septum to the lower extremity of the uvula, then every contraction would necessarily raise the uvula first, then the soft palate next, but we can see the soft palate raised so high that it will cover both mouths of the Eustachian tubes, yet not have the least effect on the uvula. Showing plainly that the elevation of the uvula and the velum are done by the two distinct sets of muscles.

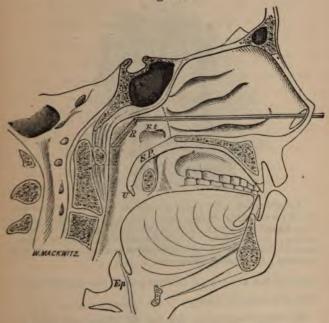
THE FUNCTIONS OF THE UVULA AND THE PROMINENCE
FORMED BY THE ELEVATOR PALATI AND ELEVATOR UVULÆ MUSCLES CONSIDERED IN RELATION TO THE EXCISION OF THE
UVULA.

In the spring of 1870, I had a patient whose right nostril was of sufficient caliber to admit my little finger in its whole length. The idea occurred to me at once, that this case presented an excellent opporportunity for examining the action of the uvula; and as our authorities say of this grape-shaped appendage, that "its use is not clear," I determined to take advantage of this opportunity to inspect its motions during mastication, deglutition and vocalization.

^{1.} Dunglison's Med. Dic.

I had the patient keep this nostril wide open with a Kramer bi-valve ear speculum. Through this large nasal passage, thus dilated, I passed a reflector, reach-





An antero-posterior section of the head; R. reflector; S. P. soft palate; U. uvula; E. t. mouth of Eustachian tube; Ep. epigiottis.

ing to the posterior wall of the pharyngo-nasal cavity (Fig. 38, R.); on the mirror (R) I directed a very bright light, illuminating the parts under observation, so that the image was reflected back to my eye very distinctly. I this way I was enabled to inspect the upper or posterior surface of the soft palate, and the

ridge on it that the elevators palati uvulæ muscles form (Fig. 39, Az-Pr.), the base of the tongue (T.), the epiglottis (Ep.), and the contents of the larynx, at the



Posterior view of the posterior nasal passages, the posterior surface of the soft palate and base of the tongue; Pt. N. posterior nares; E. t. Eustachian tubes; Az-Pr- azygos prominence, on the upper surface of the soft palate formed by the elavator muscles; S.I. Semi-lunar openings formed by the tongue, uvula and soft palate; T. base of tongue; Ep. epiglottis; U. uvula.

time of the attempted phonation of the sound "aye" with the mouth closed.

My observations on this patient were continued for a period of five weeks. Subsequently, I made numerous observations of a similar character on many other patients, each of whom had lost the septum nasi, but had perfect soft palates.

From notes that were taken at the time of these inspections, I will state what part, in my judgment, the soft palate, the uvula and the azygos prominence (Fig. 39 Az-Pr. and Fig. 40) take in the acts of masti-

cation and deglutition, and what were their positions at the time of the phonation of such simple sounds,





The image, as seen upon the hinged reflector (R), of the lower edge of the soft palate and the lower or posterior concave surface of the uvula (U), showing, also, the higher semi-lunar-shaped openings (S-I) made by the azygos prominence touching the posterior wall of the pharynx.

as show enough of their action to demonstrate their apparent function; reserving for the future, the de-

tails concerning the position of these three organs as well as that of the base of the tongue and the epiglottis during the phonation of specified sounds.

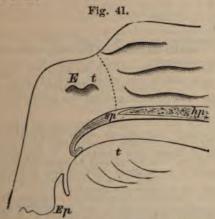
Although I know now that the uvula and the azygos prominence (Figs. 39 and 40) are not required to aid the acts of mastication and deglutition, yet I will give the results of the inspections while these processes were going on, because these results contain points of interest, when taken in connection with their action during phonation.

During mastication, the whole free border of the soft palate rested on the base of the tongue, reaching within a short distance of the epiglottis. In five of the cases, the uvula was not in sight at any time, and seemed to be doubled under the velum, so as to lie between it and the tongue (Fig. 41). Two patients had elongated uvulas, which sometimes hung down on the base of the tongue, and frequently touched the epiglottis.

During the act of deglutition, the soft palate was pushed backward by the alimentary bolus, until the posterior wall of the pharynx was reached, the motion was continued in an upward direction until the upper surface of the velum was high enough to cover and close both Eustachian tubes (Fig. 38, S. P. E.t.) pushing the Reflector (R) upward and forward; then the velum descended, as the alimentary bolus was swallowed, until its lower border touched the base of the tongue.

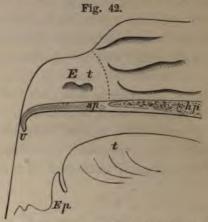
When I began to make observations, my attention

was directed to the uvula alone; but the varying height of the azygos prominence during vocalization (Fig. 39, Az-Pr.) in this, my first patient, drew my attention to it, and what I discovered with respect to it, was confirmed in the subsequent examination of the other cases, namely: that this prominence, whose existence I had known for some time, though I had never thought of assigning to it any function or use, was of as much, if not more, importance in vocalization than the uvula itself; so that, while seeking for the function of this grape-shaped appendage, I discovered a new organ, and ascertained its function at the same time.



An antero-posterior section of the hard palate (hp.) and the soft palate (sp.) showing the position of the uvula resting on the base of the tongue (t.); Ep., Epiglottis; E.t., mouth of the Eustachian tube.

During the vocalization of sounds that passed through the nose alone, the whole free border of the soft palate rested on the base of the tongue (Fig. 41), the uvula was not in sight at any time. During the vocalization of sounds that passed through the mouth



An antero-posterior section of the hard palate (hp.) and the soft palate (sp.) showing the position of the velum closing the avenue to the pharyngo-nasal cavity; U, uvula, t, tongue; Ep., epiglottis.

alone, the soft palate was raised, and about 4" of its lower border was pressed against the posterior wall of the pharynx (Fig. 42.).

From repeated inspections made while the velum was in each of these two positions, it appeared that all the sounds were uttered without the aid of either the uvula or the azygos prominence.

The favorable opportunity for observing what as sistance is rendered by the azygos prominence and the uvula, is during the phonation of such sounds as are required to pass through the mouth and nose at the same time. While these sounds were uttered, the soft palate was either suspended, so that but a small part of its central portion and the uvula rested on the

base of the tongue (Fig. 43), or it was raised to such a height, that the azygos prominence touched the posterior wall of the pharynx (Fig. 40). In each situation that the velum occupied, the communication between the fauces and the mouth, and between the fauces and the pharyngo-nasal cavity, was divided



A view of the anterior surface of the soft palate, the uvula and the base of the tongue, showing the lower semi-lunar-shaped openings (S-1.) formed by the uvula (U.) and a part of the central portion of the velum resting on the base of the tongue (B. T.).

into two equal, or nearly equal, semi-lunar openings. In the first position named, the division was made by the uvula and a small part of the central portion of the velum resting on the base of the tongue (Fig. 43, S-l), and in the second position, the partition was made by the azygos prominence (Fig. 40, S-l) touching the posterior wall of the pharynx. In one patient I noticed, on several occasions, that the uvula seemed to be resting on the base of the tongue, while, at the same time, the azygos prominence was touching the posterior wall of the pharynx.

The formation of the inferior or posterior surface of the uvula (Fig. 40, U), as well as the peculiar position in which it hangs from the velum (Figs. 38 and

39, U), indicates that this surface lies on the base of the tongue frequently, its extremity being directed forward (Fig. 41). It is evident that this position is the best one in which it could be placed, to prevent the free edge of the soft palate from being shaken by the force of the air from the lungs.

It was observed repeatedly, that the free border of the velum was not at any time suspended unsustained in the current of air during vocalization, but was always situated in such positions that it received support, which prevented it from being thrown into vibrations by the force of the air that came from the larynx. To show how the support was given, I will mention again all of the principle positions that this vocal valve was observed to assume. (a.) It was either elevated and pressed against the posterior wall of the pharynx (Fig. 42, U), during the phonation of sounds that passed through the mouth alone; or, (b) removed a small distance from the wall, but not so far as to prevent the azygos prominence from touching it (Fig. 40, seen in the image on the reflector R) for sounds that passed mostly through the mouth and a little through the pharyngo-nasal cavity; or, (c.) lowered to allow the uvula and a small part of the central portion of the velum to rest on the base of the tongue (Fig. 43), for sounds that passed mostly through the nose and a little through the mouth; or, (d.) still lower, so that its whole free border rested on the base of the tongue (Fig. 41), for the formation of sounds that passed the nose alone. In a few instances, as have been mentioned, I have seen the second and third positions combined, i. e., the uvula resting on the base of the tongue, and the azygos prominence touching the posterior wall of the pharynx at the same time (Figs. 43 and 40 combined).

From the effect of these positions of the velum on phonation, it would appear that one of its functions is to act as a valve, by directing the voice from the larynx into the mouth alone for the formation of one kind of tone; into the nose alone for another; and to divide the sound so as to allow it to escape from both of these openings, for still others. It is evident that while the velum is resting wholly on the base of the tongue, or is pressed against the posterior wall of the pharynx, that the liability for its free border to vibrate by the force of the air is reduced to a minimum; but when this valve is in either position that requires it to divide the sound between the mouth and the nose, then, on account of its free edge being suspended and placed immediately in the current of air from the larynx, the liability for it to vibrate is increased to a maximum.

A provision is necessary to prevent these vibrations. This provision, I am led to believe from my observations, is found in the uvula and the azygos prominence formed by the elevators palati and uvulæ muscles. They are located in the centre of this very mobile palate or valve, and by their support in both of the positions that require suspension (Figs. 40 and 41), prevents it from being shaken by the force of

the current of air from the lungs. There can be no doubt, that if there were no uvula or azygos prominence to prevent this thin edge of suspended flesh from vibrating, it would be shaken to such a degree, as to impart a tremulousness to the tone of all sounds, forcibly uttered, that pass through the mouth and nose at the same time.

The following questions have been asked frequently:

"1st. If the uvula is required to prevent the free border of the velum from vibrating during phonation, will not its loss impair the voice?

"2d. How do you account for the improvement of the voice in many instances, after its removal?"

The excision of the uvula can affect those sounds only which are formed by its assistance, and not then even, if they are pronounced with the usual force of voice, because the contact of the central portion of the velum on the base of the tongue will be support enough to prevent the velum from being shaken; therefore, the difficulty in pronouncing, in high and loud tones, those sounds that are required to pass mostly through the nose and a little through the mouth, will be in proportion to the amount of loss of support that the velum suffers. As usual excisions leave a stump of the uvula and the central portion of the soft palate; these will prevent any vibration during speech made with the usual force of the lungs.

I have observed that a patient, who has just undergone an operation for an excision of an elon-

gated and hypertrophied uvula, may talk immediately in an ordinary tone with greater ease than before the operation, but just so soon as he utters words with more than the usual force of voice; such, for instance, as he would require to address a person across the street, some of the efforts will remind him of the excised uvula, and though not causing as much pain as the knife did, will be sufficient to compel him to cut his sentence short of its intended length. The reason of this effect on the uvula appears to me to be this: the heavy uvula had given so much support to the soft palate, that, though it had been acting as an impediment to all kinds of sounds, the velum required very little of its own pressure on the base of the tongue to prevent these vibrations, but after the excision, greater pressure was required, and this pressure was the occasion of the pain. The loss of the uvula does not interfere with the formation of the two semi-lunar-shaped openings by the border of the velum and the dorsum of the tongue, by which the voice is allowed to escape from the mouth, and thus provide for perfect vocalization; it takes away a part only of the support from the soft palate. Even if there be no stump left by the excision, the tongue will learn to overcome the defect by the increased elevation of its dorsum, which may be made more convex than was required to form the two semi-lunar openings, than when the whole of the uvula was present, and in this way allow both a greater pressure and more of the central portion of the velum to rest on the tongue.

But if the soft palate suffer so much of a loss of substance in its central portion, that its concavity is equal to the convexity of the dorsum of the tongue, thereby preventing the formation of the semi-lunar shaped openings, and neutralizing all support, there will be some sounds-such as pass mostly through the pharyngo-nasal cavity, and a little through the mouth-given imperfectly in spite of all efforts to overcome it, because the proper tone requires that the velum should be raised to allow a part of the sound to pass to the mouth, and this act of elevation exposes it to the force of the air from the larynx, which force is the cause of the imperfection of the sounds, by causing the unsupported edge to vibrate. Again, if the loss in the center of the velum be greater than can be closed by the greatest convexity of the dorsum of the tongue, the disability will be equal to that caused by a perforation of the soft palate, and in addition, there will be a tremulousness to many semi-nasal tones, on loud speaking, as addressing an individual at a distance. That the intermittent tone is occasioned by the vibrations of the central portion of the velum, is evidenced by pain or weariness in this part after lengthy speaking in a loud This pain was experienced by two patients voice. while under my care, whose soft palates were notched to this extent by ulceration.

In answer to the second question—"How to account for the improvement of the voice after removal of the uvula?"—I would ask, if it is claimed that

this improvement in speech is equal to the patient's vocalization at the time that his uvula was in a healthy condition. I am sure-because the observations made on this subject during the last seven years have taught me to be so-that the answer to this question should be given in the negative. That a relative improvement in speech does follow an excision of an elongated or hypertrophied uvula, there can be no doubt, because this operation brings the organ nearer to its normal size and condition; but it resembles the improvement made by perforating the membrana tympani in a case of deafness caused by a closure of the Eustachian tube; such improvement can never equal the normal function of the organ. This being the case, the effect of the excision will be to remove the cause of the mechanical hindrance to every word uttered by the patient, made in any degree of force, and it will leave a stump which will not be a cause of hindrance, but a cause of inability to pronounce some words on forced vocalization only, and this even will be overcome in time by the dorsum of the tongue becoming more convex. Therefore, to admit that the removal of a uvula thus diseased may improve the ability to speak in the usual tone of voice, does not prove that it was the uvula's removal alone, that was the origin of the improvement, for, if such were the case, the excision of the healthy uvula would not only be advisable, but desirable.

The effect of the amputation of the whole of the uvula, besides its being a loss of the greater part of

the support to the velum, prevents the formation of the lower portion of the azygos prominence to its greatest height, which is done by the contraction of the elevator uvulæ muscles, which form the uvula. This height of the prominence is required to prevent, by its contact with the posterior wall of the pharynx, the vibrations of the velum during the formation of many semi-nasal sounds.

The nearer that the surgeon can make the diseased uvula take the shape and size of the normal one, the nearer will it approach its normal function, that is, rendering the soft palate a non-vibratory valve, which is required for perfect phonation.

CHAPTER XXX.

OPERATIVE MEASURES.

EXCISION OF THE TONSILS.

Excision of the tonsils is probably the most frequent operation of the throat. While it is not a very difficult or painful operation, yet it is well to prepare the throat and the system for it.

I have not, for the last ten years, excised a tonsil before I have treated the throat and pharynx at least for one or two weeks. In every patient who has enlarged tonsils, the mucous membrane of the throat is dark red or blue red in color, showing that the congestion is very great. Of course a wound made in the tissues in this condition, will heal slowly and will be very painful. For this reason, I make daily local applications for a week and then every other day for about one week more. I do this to reduce the inflammatory condition as much as possible. The secondary effect of the operation is not nearly so painful after the swelling is reduced to its minimum.

The instruments with which I prefer to operate are the probe-pointed curved bistoury and a four-toothed volcella. In every instance, I require the patient to hold his tongue depressed with the tongue depressor. I then grasp the lower portion of the tonsil with the volcella, raise it and pass the back of my bistoury along the tongue with its edge upward, and make the cut upward in a circular direction near to but avoiding the arch of the velum.

If the tonsil is large and flat, I take but a very thin portion of it off, that is, I endeavor to cut off the top of the hypertrophied glands, so that the contraction that follows from the cicatrization of the wound will cause the absorption of the remaining hypertrophied portion of the tonsil.

As the pain from excision of the tonsil is not very great, I do not administer an anæsthetic, nor would I recommend it. Immediately after the excision, I spray the fauces and cut tonsil with vaseline that has in solution about one-fourth per cent. of carbolic acid.

For several days the patient should eat soft and light food. The throat and tonsil should be sprayed once at least, or twice each day, until the cut surface has healed. I have never yet required any other treatment than this after the operation.

In three or four days, the wound in the tonsil will be healed and all the temporary pain arising from the excision will have passed off.

CYSTS OF THE TONSILS.

Not unfrequently the enlarged follicle of a once hypertrophied tonsil becomes so full of a creamy colored, inspissated mass of muco-pus, of a cheesy consistency, and fœtid, that they can be seen to protrude from the side of the tonsil. Especially if the throat is a little sore, it may be taken for a diphtheritic exudation.

Instead of being noticed in the tonsil, the patient may, after an effort at coughing, see the small round ball—a little smaller than a common pea—leave the mouth and roll across the room on the floor.

It is not often that patients apply to the physician to be relieved from these periodical collections, as they give almost no annoyance at all. But should they require to be relieved, cauterizing the follicle from which the ball came will not stop the deposit of secretion for the formation of another ball.

The only sure remedy is to take a thin slice off from the tonsil. This will cut off that portion of the follicle that forms an almost shut sack, and leave the secretion free to flow away from the tonsil, instead of its being pent up, until the accumulation is so great that the sack cannot hold it.

The instruments employed are the volcella and bistoury mentioned in the first part of this chapter.

A few day's treatment by the spray of vaseline and pinus comp. had better precede the excision.

Sometimes, instead of these cheesy balls, the contents of the follicle will be a concretion of chalky material. If this is the case, the concretion had better be removed before the excision of the tonsil is attempted.

EXCISION AND INCISION OF THE UVULA FOR ELONGATION
AND GEDEMA.

The uvula is very frequently entirely cut off, to the injury of the patient. If a patient states that he has a tickling cough, and his physician looks in his throat and sees an elongated uvula, the diagnosis is at once made that the uvula causes the tickling. He tells the patient that this elongated organ by its continual irritation on the base of the tongue, etc., causes the tickling cough. I very much doubt that even a uvula one inch long would cause a tickling in the throat, with or without a cough. Tickling is not the symptom of an elongated uvula, as there is no time, even in the normal throat, that it does not touch the base of the tongue, posterior wall of the pharynx, and very frequently the epiglottis itself. This being the case what will cause the tickling?

The only symptom of an elongated uvula that I have learned from patients is that of a pulling on the soft palate at the instant of deglutition, and this is sometimes followed by a retching effort. Not one uvula in a hundred that is now amputated in its entire length should be touched by an instrument.

When an operation is required no portion of the muscles that compose the uvula should be excised. The portion of the ædematous uvula that contains the most serum is in its lower part; if the whole organ is swollen and ædematous then a vertical slit will allow the escape of the fluid; if the lower portion is

separated from the muscular portion, for a quarter of an inch or more, than this portion, which is made up of connective tissue alone, may be cut off horizontally.

As this condition of the uvula is but a consequence of inflammation of the pharyngo-nasal cavity, the treatment of this cavity should at once be instituted. It is in this way only that the diseased uvula can be brought back to its normal condition.

PARESIS OF THE SOFT PALATE

In many long standing cases of pharango-nasal catarrh, the velum palati becomes so debilitated that it cannot perform its functions perfectly. When the disability is marked, portions of food, such as small pieces of bread, meat, potatoes, etc., pass up behind the soft palate, and either lodge in the pharyngo-nasal cavity or become crowded into the posterior nares. I had a patient who, in this way, got a piece of a peanut in the posterior nares, where it remained for fully six months. It occasioned a spasmodic, peculiar cough. It was more of a sneeze than a cough, yet a mixture of both sounds. The patient was a girl about thirteen years old. She made this sneeze-cough about twenty-five times a minutes, while she was awake. There was no difficulty in getting a good view of the pharango-nasal cavity, as the velum, while it did sometimes raise, hung pendant most of the time.

On the first examination I observed a small, white substance—it proved to be a piece of soda cracker in the neighborhood of the Eustachian tube. The passage of a probe, with a cup-shaped end, one-sixth of an inch in diameter, through one of the nostrils, dislodged the cracker, and, to some extent, relieved the patient of the spasmodic sneeze-cough. After she was treated for chronic inflammation of the nasal and pharango nasal for about two weeks, I again passed the probe through the nostrils, and came in contact with a hard substance that could not be moved. Persistent efforts to remove it was followed by vollies of the spasmodic sneeze-cough. At the next visit I succeeded in pushing from its resting place the peanut. Its dislodgment was followed by quite a flow of blood, but the spasmodic peculiar cough was much lessened.

I had another patient whose soft palate passed a piece of gristle up the pharyngo-nasal space, where it remained for some days before it occasioned any symptoms of inconvenience. He first felt pain, then an excessive noise in the ear. He had not forgotten the passage of the piece of cartilage, and directed me to look for it. There was no difficulty in both seeing and removing it. Relief of the symptoms followed the removal.

Dr. Hodgen presented, before the St. Louis Medical Society, the soft palate, and parts that compose the pharyngo-nasal cavity having a five cent nickel wedged into the mouth of the Eustachian tube. The nickel had undoubtedly been lodged there for some time before death, and must have occasioned serious inconvenience.

It may appear strange, but fluid is less apt to pass up behind the debilitated velum than are solids.

When complete paralysis takes place some, of all kinds of food is apt to find its way in the passages behind and above the soft palate. It would be expected, from what has been said on the functions of the velum paliti, uvula and azygos prominence, that in case of paralysis of this valve-like organ, the voice would be materially affected. But little can be done for this disability, as it is nearly always accompanied by other and severer complaints. Electricity has, in some instances, been of benefit, but nothing of a marked character.

TUMORS OF THE UVULA.

The growths that spring from this small organ are never very large, nor do they create much inconvenience. Their removal is easily accomplished by a pair of forceps to grap the tumor and a pair of scissors to clip it off. Frequently no hemorrage follows the operation, as the tumor usually has but a slender pedicle.

REMOVAL OF NASAL AND AURAL GROWTHS.

The nasal polypus forceps is a very good instrument for the revulsion of these growths. But frequently they allow the tumor to slip from its grasp, and for the purpose of preventing this, I have devised an instrument (Fig. 44) that closes with a lever (a) which pushes a ring (b) over the arms of the forceps. This instrument firmly grasps the tumor and allows rotation.

For several years I have been removing growths that are not gelatinous by the hyperdermic injection of a solution of carbolic acid.



Polypus Forceps. a, a lever that pushes a ring, b, over the arms of the forceps and closes them on the growth,

The strength of the solution used is from 2 to 5 grs. of the white crystals of carbolic acid (Malencrodt's) to an ounce of water. About 5 ms. of this solution is slowly injected into the growth once each day, provided the injections are painless or nearly so. The anæsthetic property of the acid annuls the pain occasioned by the introduction of the needle into the growth.

The removal of thickened membrane covering the turbinated processes and the septum nasi, is very frequently a tedious operation. I have, in a few instan-



Heavy scissors for clipping hypertrophied growths in the turbinated processes.

ces, during the last seven years, employed a heavy pair of seissors, (Fig. 45) which I thrust into the nostril containing the hypertrophied turbinated process, and grasped the growth between its blades, and then chipped it off. This is followed by profuse hemorrhage, and causes no little pain for a short time. To check its flow of blood and assauge the pain, I inject by means of the catheter nasal douche a pleasantly cool two per cent solution of carbolic acid into the nostril, and keep the stream of the solution slowly flowing until it comes away uncolored by blood. By this means the flow of blood will be entirely checked in about fifteen or twenty minutes, and the pain pass off in from five to ten minutes.

I have also injected these growths with the carbolic acid solution mentioned, but the result has not been such as to cause me to depend upon it alone. The injection of the eretile growths on each side of the septum nasi has been more satisfactory.

Dr. Jarvis, of New York City, presented to the American Laryngological Association a steel wire ecraseur, by which he claimed that he could remove hypertrophied turbinated processes in an almost painmanner. I have made the effort to use same means, but I must have misunderstood him as my wire caused more pain than did the heavy scissors referred above, that is, it lasted longer and was more agonizing. The compression of the highly sensative tissues must be so very great that the wire cuts because further condensation of the structure is impossible. It is the condensation, more than the cutting that causes the intoler-

^{1.} See Transactions for 1880.

able discomfort. Could this be done without causing so much pain, it would undoubtly be a great step in the advance of all present modes. In one case I injected a 5 per cent solution of carbolic acid into the hypertrophied mass before applying the wire, which had the effect of greatly reducing the pain.

The galvano-cautery is too painful, for this reason, it must be abandoned.

AURAL POLYPI.

I have known small aural polypi to be absorbed, if the otorrhea was checked by treatment. I have observed that frequently if the tumor is so large that it can be grasped easily, it had better be well crushed by the forceps. I do not think that it is good treatment to pull them out, as the resulting effects are frequently such as to cause excessive contractions of the mucous membrane of the middle ear, which may interfere with the movement of the ossiculæ, and result in permanent deafness.

The injection of a two per cent solution of carbolic acid into the aural polypi will very frequently so benumb the parts that they may be crushed without much pain to the patient, but should dizziness or excessive exhaustion follow, the surgeon should on that instant desist.

I have a record of several cases in which the tumor was so large as to protrude at least one eighth of an inch beyond the perforation of the membrana tympani. It entirely disappeared on the continuous use of the injection of warm salt water, with one fourth per cent of carbolic acid, after the crushing operation.

STENOSIS OF THE NASAL PASSAGES.

There are required, usually, two causes acting at the same time, to complete a nasal stenosis: one a deflection of the septum, the other a hypertrophy of the tissues covering one or more of the turbinated processes.

To obtain relief without an operation, push into the closed cavity a slender slippery elm tent, and allow it to remain until it has dilated the passage; spray the parts thoroughly on its removal with vaseline and pinus comp., after which pass in another tent, and so continue as long as the patient is not greatly inconvenienced by the pain. As soon as the parts have been opened they should be sprayed once daily to allay the chronic inflammation, which, if it can be done, will result in the nasal passages remaining open permanently.

Should the passage not remain permanently open, then more radical measures will have to be resorted to. The method of removing a hypertrophied turbinated process has already been described on page 381. If the relief afforded by this operation is not sufficient, then the septum nasi will have to be so operated upon, as to cause the cut edges of the septum to ride upon one another. This can be done by an oblique cut through the cartilage, where most of the obstruction exists. The hemorrhage is never very great.

NASAL ABSCESSES.

The usual site for an abscess in the nasal passages, is on one of the alæ. I have seen them more frequently on the left than the right side. In a majority of instances the abscess starts in a hair bulb, and extends in all directions, sometimes piercing the wall of the alæ and showing itself on the outside. When this is the case, an erysipelatous inflammation not unfrequently supervenes. If the case is left to its own resources for a day or two, constitutional symptoms will then be experienced, slight chilly sensations, "soreness of the bones," pain in the head and face, etc.

If the patient is seen in the earlier stages of the complaint, the opening of the abscess by a short bistoury, and the application of the spray of vaseline, having one-fourth per cent of carbolic acid dissolved in it, will end the whole matter. If seen when the abscess has made its appearance on the outside of the alæ, great care should be taken that the opening be made on the *inside* only, as the least perforation of the abscess on the outside will result in a contracting, disfiguring cicatrix. It will be well to apply plain vaseline to the whole nose on the outside, and the spray of vaseline and carbolic acid mentioned above, to the inside.

Should the case not be seen until erysipelas of the nose has set in, do not put on that useless stuff called tr. iodine,—for it only hides the fiery redness,—nor the less useful liquid called colorless tr. iodine.

Have your patient remain at home, not necessarily in bed; after you have opened the abscess on the inside with a bistoury, spray the parts with the vaseline and carbolic acid; apply vaseline to the outside of the nose, and to all of the parts of the face that are the least red; prescribe a ten grain dose of quinine, to be repeated every five hours for three times, and a laxative to be taken at once.

Should the abscess appear on the septum or on any of the turbinated processes, open it with a bistoury at the site of its pointing, and treat as above described.

ABSCESSES OF THE PHARYNGO-NASAL CAVITY AND THE PHARYNX.

It has not been my lot to see a patient who had an abscess in the pharnygo nasal space. I have seen one only who had an abscess of the pharynx. Patients who have had an abscess in the pharyngo-nasal cavity are not very rare, but far from common. I am at present treating three patients, each of whom must have had a very large and severe abscess on the basilar portion of the occipital and sphenoid bones, as the opening is still visible, and in one of them quite large.

The abscess in the pharynx that was seen was quite large, almost large enough to completely fill the breathing space at the base of the tongue. There was severe constitutional disturbances before it was opened. As a preliminary step at its opening, I introduced a hypodermic needle and withdrew a part of its contents, and found it to be composed of a

glairy, milky, mucus mixed with blood. The contents of the abscess measured nearly two ounces. A complete aphonia, accompanied with difficult breathing was entirely relieved on the discharge of the abscess.

CALCAREOUS ACCRETIONS IN THE NASAL CAVITIES.

In my practice I have met with but seventeen patients who had calcareous accretions in their nasal passages. Every one of these was afflicted with syphilitic ozæna, and had ulcerations of the soft parts; some had caries of the bones also.

The removal of the accretions in the easiest way possible, followed by the thorough cleansing and treatment by spray, results in freeing the breath of the sickening odor that usually attends this disease. There is no special mode of removing these chalky accumulations. A slender probe, one that can be easily bent to suit the different sinuses to be explored, may be used to find their locations. To one unaccustomed to the topography of the nasal cavities, he might be apt to call a calcareous accretion, a necrosis of one of the bones, and vice versa.

It not unfrequently happens, however, that as a part of a bone is melted away by necrosis, the space left is filled by one of these rhinoliths; when this is is the case, it is impossible, if judging by the sensations of contact, to distinguish one of these accretions from a portion of bone undergoing necrosis. If a slender pair of forceps is passed to the suspected spot, and made to take hold of the rough object, if it is a chalky accretion, it can, after a few slight efforts

at withdrawal, be found to become movable. In the majority of instances, if it is easily moved, it may be called a chalky deposit, if not a necrosis.

The treatment of such cases in no way differs from other cases of chronic, profuse catarrh, except in the removal of the rhinoliths, and the additional treatment for syphilitic taint.

STENOSIS OF THE PHARYNGO-NASAL CAVITY.

The agglutination of the velum palati to the posterior wall of the pharynx, occurs in such cases only where the posterior wall of the pharynx, and posterior surface of the soft palate are ulcerated, and to which nitrate of silver in strong solution or in the solid form has been applied. At least this is my experience. I have met with seven cases in whom this disability has occurred.

The occlusion of the space between the pharyngonasal cavity and the pharynx was in no instance complete. Each patient has a small opening through the velum, one-fourth inch in diameter. Of course the voice is more or less nasal in tone. In one patient I inserted a hard rubber eyelet to provent what I feared, complete closure. This eyelet was worn for about three years and then removed. On the third year after its removal, she reported that she felt much better without it, as the opening is large enough to allow unimpeded respiration.

Surgical interference is needed only when respiration cannot be carried on through the nostrils, as these cavities will not remain in a healthy condition without the continued passage of air through them. If surgical interference is needed I would recommend, as I did in one case, that a slit be made latterly across the velum, about a quarter of an inch from the posterior wall of the pharynx, and that a soft rubber eyelet, with large flanges, be immediately inserted in the opening. The flanges should be sufficiently large to prevent its being pushed up into the pharyngo-nasal cavity on deglutition or to allow its falling into the throat.

Cutting out a piece of the velum will not prevent the cicatrized contractions from again closing the opening. If the opening is too large, the tone imparted to the voice will be nasal and in fact will be a greater disability than a small opening, on account of defective deglutition, as part of the food will pass up into the pharyngo-nasal cavity.

EPISTAXIS.

"Epistaxis, especially in aged individuals, sometimes seems to occur physiologically in relief to the vascular turgescence within the cranium or in the face; and this often affords spontaneous cessation to a determination of blood to the head, and to violent cephalalgia, noises in the ear, vertigo and sleeplessness, with dryness, heat or irritation of the nasal passages, and so on."

Whoever saw a patient who had violent cephalalgia, noise in the ears, vertigo and sleeplessness, with dryness, heat or irritation of the nasal passages, and was unaffected by long standing, severe chronic inflammation of the nasal and pharyngo-nasal covities?

^{1.} Italicized by the author.

The physician who makes such a diagnosis must have made but a very superficial examination of the subject.

It is both dangerous and short-sighted to say that an epistaxis can occur physiologically; dangerous because it says to the patient you are entirely healthy, when in reality he has had a chronic catarrhal inflammation in his nasal passages for many years, the epistaxis itself being an evidence that the long existing congested vessels have lately had more blood forced into them than their already attenuated walls could withstand; and short-sighted to say that the bursting of a blood-vessel was a physiological act. It might as well be said that the fracture of a bone is a physiological act!

The hemorrhage may take place in any part of the congested mucous membrane of the nasal or pharyngo-nasal cavities, or in the pharynx. When the hemorrhage occurs in the pharynx or even in the pharyngo-nasal cavity, it may be taken for a hemoptysis. This mistake in diagnosis has occurred, not very unfrequently, to the great terror of the patient. If the blood will leave the mouth without the effort of coughing—the patient leaning so far forward that the posterior wall of the pharynx is placed horizontally—it may be decided that the hemorrhage comes from congested mucous membrane located above the vocal cords.

If the hemorrhage has continued for a longer time than usual, and a larger quantity of blood than half a pint has already flown out, and the ruptured vessel is located in either nasal cavity, a weak solution of the pleasantly cool salt water (3 j ad O j) and carbolic acid (1 per cent) by means of the catheter nasal douche, should be made to flow into the nostril from which the blood flows. Should the hemorrhage flow from the pharyngo-nasal cavity or from the pharynx, a long continued spray of the same solution, at the same temperature should be applied. If the exact location of the vessel can be detected, a small sponge, holding a weak solution of the persulphate of iron, applied to the spot, will check the flow.

All harsh means should be avoided, or only resorted to after milder measures have failed. I have not failed to check the hemorrhage by the measures indicated, even when it occurred in patients who had typhoid fever and small-pox. I would not resort to plugging the posterior and anterior nares until I had applied ligatures to the extremities, one at a time. This method will retain in the extremities fully one-fourth more of the volume of blood than usually goes to them, and thus take away some of the pressure from the congested blood-vessels.

THE TUBULAR LARYNGEAL FORCEPS.

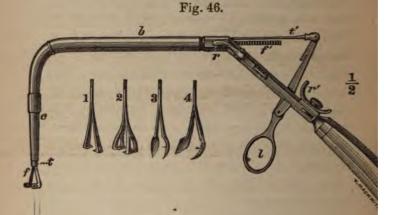
The obstacles encountered in the extraction of laryngeal tumors are numerous, and to a certain extent prevent their removal.

One of the difficulties in the way is, that the greatest length of the vertical portion of the laryngeal forceps which can pass into the pharynx without touching any of its parts, is not long enough, in a large majority of cases, to reach the vocal cords without, at the same time, depressing the base of the tongue from one-fourth to three-fourths of an inch.

The patient may learn to tolerate the pressure on the tongue, and to overcome the natural tendency of the fauces to close spasmodically when touched, but it requires from one to three weeks' practice to do so. Even after this practice, the force exerted by the tongue in its upward action—a result of pressure upon it—is not always the same, because of the mental apprehension so natural and even unavoidable with patients about to undergo such an operation; therefore, the power required to overcome the resistance varies to such an extent, as to occasion frequent failures.

The length of the vertical portion of a laryngeal forceps is necessarily limited by the boundary of the space through which it must pass to enter the larynx; that is, during its passage, no part of it should touch the base of the tongue, the soft palate, the epiglottis or the posterior wall of the pharynx, since mere contact of the instrument, in a throat not educated to such usage, would produce instant depression of the epiglottis, if not closure of the fauces, and consequently the attempt to reach the vocal cords would not be successful.

To overcome this obstacle, I have devised an instrument (The Tubular Laryngeal Forceps, Fig. 46,) which can be passed readily into the larynx, and then lengthened to the extent required to reach the vocal cords in the longest neck. It consists of a tube (b, c,) seven inches long, bent at a right angle, forming a horizontal and a vertical portion, the latter (c) being two and a half inches long. To the horizontal portion of the tube (b) is



Tubular Laryngeal Forceps.

attached a handle (h) six inches long, at an angle of 45°. On the handle is a lever (l) two and a half inches long; this is connected with a rod (t') which passes through the entire length of the tubular portion (b, c) and is attached, at its lower extremity, to a smaller tube (t) within the larger one, by which the vertical portion (c) is lengthened, and the forceps closed at will. Underneath this rod, is another rod (f'), whose upper extremity is serrated, which also passes through the tubular portion, and terminates in a socket; into this socket is screwed the forceps (f). There is a

slide on the handle, which is moved by a hook-shaped projection (r'). This is so connected to two levers which act as retainers (r), that pressure on the hook-shaped projection (r') causes the retainers to grasp the serrated rod (f') and hold it in the position desired, and thus prevent the further descent of the forceps. The outer side of each limb of the forceps is serrated, the purpose of which is to cause the descending tube, that closes them, to retain its hold, or position, even when the pressure on the lever is withdrawn. Forceps (1, 2, 3, 4 and f) of various shapes and sizes may be used.

The method of using the instrument is as follows: After the vertical portion (c) has been introduced into the larynx, it is lengthened by the lever (l) pushing both rods (t') into the horizontal portion (b), which causes both the smaller tube (t) and the forceps (f) to descend (see dotted lines). As soon as the length desired has been attained, then the serrated rod (f') is arrested by pressure being made on the hook-shaped projection (r') with the thumb, causing the retainers to grasp it firmly, retaining it and the forceps in the position required. The forceps are then closed by continuing the pressure on the lever (l), causing the rod which is attached to it (t') to push the smaller tube (t) over the base of the forceps, which closes it on the tumor or body to be withdrawn.

GROWTHS IN THE LARYNX.

Although polypoid growths in the larynx are not very common, yet they occur frequently enough to occupy a large share of the space in the literature of the throat. A few of these growths are apparently gelatinous, and require but to be well rubbed with a a piece of dry sponge to cause them to disappear, especially if they have their origin in a catarrhal condition of the larynx, which, on being improved by both local and constitutional treatment, will remove that which sustained their growth.

On two occasions I have grasped a tumor on the vocal cord, but desisted from extracting it on account of the symptoms of the patient. On examination of both of these patients one week afterwards, there was nothing to be seen of either the tumor or of any marks left by the forceps.

I generally treat my patients two or three weeks before attempting to remove tumors from the larynx. In this way I prepared my patient so that the unpleasant effect of the operation is quite short and not at all inconvenient. I have also observed that this preparation prevents any serious spasm of the larynx, when the tumor is grasped by the forceps. On the last occasion of the extraction of a laryngeal tumor, I drew on it for at least three seconds before it gave way, and during that time the patient was able to make at least two full respirations, showing that the irritability of the throat was not great, and that

the preparatory treatment had removed some, at least, of the excessive sensitiveness of the throat.

Before I instituted these preparatory treatments, every operation for a tumor occasioned so much strangulation as to cause the patient's face to turn purple, and every effort to speak brought on a spasm of the glottis. After one of my patients recovered from the strangulation, he declared that if he had fifty tumors in his larynx he would prefer to let them all grow rather than have one of them extracted.

On another patient I operated and removed five tumors, one after the other, leaving two remaining in the larynx. On the extraction of each tumor the spasmodic closure of the glottis was so very unpleasant that he determined to carry the two remaining tumors with him to his grave.

I am now very confident that had I prepared these two patient by two week's treatment of the pharyngonasal cavity, the pharynx and the larynx, that I could have removed all of the tumors without a single spasm, as they were men of great nerve and resolution.

PERFORATING THE MEMBRANA TYMPANI FOR DEAFNESS OCCASIONED BY A EUSTACHIAN TUBE THAT DOES NOT ALLOW THE ADMITTANCE OF SUFFICIENT AIR.*

I believe that maintaining an opening in the membrana tympani will prove an adjuvant in the treatment of many cases of chronic inflammation of the Eustachian passage and of the midddle ear. Its advantages are two folds, viz.:

One, the hearing of the patient, is instantly increased by the perforation of the drum head, and this perforation puts a stop to the ever present tendency of the membrane to be drawn inward by the excess of rarefaction of the air in the middle ear and mastoid cells, which is occasioned by the inflamed condition of the Eustachian tube preventing sufficient air to enter the cavity and cells. As the membrane is drawn inward by the excess of rarefaction, the possibility for it to vibrate by the sound waves is lessened, and, as in other joints where motion is greatly impeded, the ossicula lose their ability to move with the freedom that they do when in the normal condition, and thus prevent the transmission of the sound waves to the internal ear.

Another advantage is the improved opportunity to apply remedies to the tube and middle ear. As it is, with the imperforate membrane, our opportunity to

^{*.} This operation was first suggested by Prof. A. Politzer, in 1868, who inserted a rubber eyelet to prevent closure.

treat the tube and middle ear is almost reduced to nil.

Perforating the membrane may be done by a twoedged, sharp-pointed knife, 2" in width. The opening need be but 3" in length. In the few cases on whom I have operated, I inserted the eyelet immediately after the opening was made in the drumhead, using for this purpose a slender angular forceps. The eyelet was held by inserting the points of the blades into its opening, and then spreading the blades. As soon as the eyelet was properly placed in position in the drumhead, the forceps was withdrawn.

The result of my operations, taken as a whole, have not been very satisfactory, because I did not know the kind of cases to select. My first case was quite successful. The next three cases were not improved, but were not made worse, which is a very important negative result. The remaining six cases were slightly improved at once. The last two cases operated upon were treated for about two years, with the result of increasing their hearing more than could have been done with the imperforate membrane.

In the first five cases, I used hard black rubber. This is dangerous as it deteriorates from the contact of the fluids of the ear, and is liable to break into two pieces, one of which will necessarily fall into the middle ear. Pure gold is the only material that should be employed. In one of my cases, one-half of the eyelid dropped into the middle ear and remained there for four or five months, without causing the least inconvenience to the patient. One day he felt some-

thing tickling his ear, and in relieving the sensation with his finger, removed what he thought was the whole eyelet, but what proved on closer examination to be its outer half only. For fear that it might set up serious inflammation, should he take cold in the ear, I opened the membrane down to the floor of the middle ear, and then washed the inner half out with water. The opening in the membrane did not close again, so there was no necessity for inserting another eyelet.

I removed the rubber eyelet from one patient and expected to insert a gold one, but the opening remained patent for one year at least, and, as he has not reported, I think it is still open, as his hearing was greatly improved from the instant the knife allowed the air to enter the middle ear; I think that he would have visited me had his hearing become defective.

The other patients I have not heard from for several years. When I did hear from them they reported that they did not know what had transpired in their ears. They reported that their hearing retained the improvement made by the perforation.

CHAPTER XXXI.

REPORTS OF CASES.

PATIENTS SUFFERING FROM DISEASES OF THE NASAL CAVITIES PRINCIPALLY.

There is no better way of presenting a disease and of learning its features and the method of its management than by studying all the phases in which it presents itself. These reports are given with this object in view.

CHRONIC CASES THAT REQUIRE TREATMENT NEARLY EVERY FALL OR SPRING WHILE THEY LIVE.

The vast majority of catarrhal patients who seek medical aid belong to this class. Having been discouraged by their own medical adviser, who belittled their complaint yet failed to give them relief, and having experimented with one after another of the numerous nostrums seen in the public prints, they go flitting from one physician to another, endeavoring to get rid of their symptoms. Generally they gradually get worse from one cause, sometimes from two. One, in consequence of the continually increasing chronic inflammation, causing greater impairment of some important organ; the other, from efforts honestly but erroneously made to quickly cure them by local applications that have a more or less irritating effect, which of course will not decrease their trouble. Thus, in all likelihood,

they will not only be victims of acute accessions to their chronic complaint during life, but when they come 'to shuffle off their mortal coile" even if death be caused by another disease, this complaint will be so severe that it will assist in hurrying on the final catastrophe.

I have no hesitancy in saying—taking into consideration the large number of persons afflicted, together with the degree of their affliction—that this stage of catarrhal complaint represents a greater amount suffering than is represented by any other disease we treat, yet these patients receive, from our profession, less aid and sympathy than any other class of patients.

The question may be asked, why must the treatment, at each change of the season, be continued indefinitely; why cannot these patients be cured by several months or at most several years appropriate treatment?

The answer to the first part of the question is, that a treatment that will subdue the symptoms and leave the patient unconscious of any affliction in the head, or in any organ connected with it by important nerves, is all that local and constitutional medication can do; the remainder must be left for the reparative processes to nature alone. And right here comes the answer to the second part of the question. The reparative processes of nature are not equal to the task of bringing back to the normal condition, those blood vessels, nerves, glands, etc., that have taken

from fifteen to forty years to become abnormal; the changes made in this long period are too great and too permanent to be transformed back to the normal condition by several months' or several years' treatment of any kind, or even during the latter one-third of the life of a patient. While this is true, it is possible to so treat this class of patients by a few appropriate applications each fall and spring, or each fall or spring that they can be maintained in such good health that they will experience but little if any inconvenience whatever from the complaint.

This is what I call successful treatment of this class of patients, and in my opinion, this is the most that can be done for them. When this is done, they live a life entirely exempt from the excessively distressing symptoms that this disease entails, but not exempt from future liabilities to attacks of cold, which, if not treated by appropriate local and constitutional medicature, will again bring on even more than all the former distressing symptoms.

Patients that Wake up at Night Experiencing Sensations of Fright.

Case XIX.—Miss J——, æt. 28, consulted me in August, 1869, for sore throat, but as will be seen from her history, this was the least of her troubles. She says:

"One of my earliest recollections of reproof from my parents and friends was for my attempts at removing from my palate something that almost continually annoyed me, but of which I made no remark, for I supposed that every one had the same difficulty but was not quite so much given to fussiness as myself. "I do not remember that the place then felt sore, or grew any worse in any way; but later every cold settled there, and the palate got inflamed and quite sore.

"Somewhere about the year 1860, I began to be disturbed in my rest at night by frightful dreams and would wake up very nervous and scared, and could not sleep again for hours. This went on for years, I gradually becoming more wakeful and more cowardly, as I then thought. I got so that no matter what time I went to bed, I nearly always woke at 12 o'clock, but never was asleep at 1. If I retired at 9 o'clock, I slept until 12; if I went to bed at 11, it was just the same; I woke at the usual time. If I was up at midnight engaged with company, I did not escape the distressed feelings, which I cannot describe.

"When I awoke my eyes would open, but I was often at a loss to know whether I had been asleep at all or not. My head would burn, but I had no pain. The room would seem full of sparks of fire, and my hearing so acute as to be painful. I would do such things as would only be expected of a crazy person. I kept a broom in my room for the purpose of putting it up the chimney, to be sure that nobody was there. I would grope around under the bed, in the dark, feeling certain that some person was in the room besides myself. Many times my head has been in such a state that I was sure beyond a doubt that some one was breaking down my room door, when the actual fact was that there was perfect stillness in the house. Sometimes the house became so intolerable to me that I wrapped myself in the blankets This condiand set out on the second story porch. tion always lasted until daybreak, when I would sink quite exhausted upon the bed and fall asleep. I always attended, during the day, to my usual duties, but grew so nervous that I would never willingly encounter a strauger. In this state I lived for some three or four years, getting neither sympathy or relief.

"After a time this fever did not go off with day-

light, but was apparent during the day to my friends. They saw a strange look in my eyes and made me

seek medical advice.

"About this time a friend visiting from Cincinnati would notice an unnatural roughness in my manner at times. She would give me a look in the face and say 'never mind, I know what is the matter.' The others would make light of it, so as not to hurt my

feelings.

"The disease then seemed to settle in my throat. I could scarcely speak a half dozen words without very great pain. I was obliged to hold my head with both hands, as if to keep it from falling off, so swollen and heavy it would feel. It seemed as if both sides of my throat were rubbing together. I have suffered more than words can tell through that period of my life; that is, for eight or ten years."

This very interesting history was given some time after I had her under treatmeat. The appearance of her pharyngo-nasal and nasal cavities were of a black blue color, fully as dark as is seen in the tobacco smoker. On the basilar portion of the occipital bone was an opening of what appeared to have been an abscess or the atrophy following a prolonged inflammation. From this opening or depression there was seen a string of tough, offensive mucus. Another but smaller string was seen to flow down the superior surface of the soft palate. Her tonsils were slightly enlarged. I treated this case a great many years, and from it more than from any other, I learned how to treat this most insideous, tenacious, and common disease.

It would not be instructive for me to give in detail how I waded through the long list of remedies recommended in the medical journals of the day. I soon found that by mild application, combined with thorough cleansing, I gave the most relief. But it was not until I commenced the application of cosmoline, that I could give a thorough cleansing and treatment, without the dread that the secondary effects of my applications might be more unpleasant than the primary effects were relieving.

Her recovery from these symptoms was complete, yet slow. I had not then the experience I now have in this phase of the disease. I have not the least hesitancy in saying, that every symptom of which she complained should have been subdued in six weeks, instead of taking nearly one year, as it did.

Patients that had asthma that were relieved of the attacks for many months by the removal of nasal polypi.

Since 1869 I have thought that every victim of asthma, was, and had been for several years previous, a victim of nasal catarrh. Since that time I have taken special pains to enquire of asthmatic patients concerning their liability to frequent and prolonged attacks of cold in the head previous to their first attack of asthma, and have learned from every one of them, that they had been taking colds for a long time. My views have been proven, in various ways to be correct; one, that the treatment of the nasal catarrh cuts short the asthmatic attacks; another, that the removal of nasal polypi, in addition to treatment, resulted in preventing an attack for seventeen months; in another patient for twelve months; in three for a little over six months, and in five for about four months.

I have for over two years felt that I could prognosticate either a complete or a long cessation of an attack in those asthmatics of one year's standing, from whom I removed large gelatinous polypoid growths, especially if they were located in the posteior portion of the nasal passages or in the pharyngo-nasal cavity.

The following cases will illustrate what I mean, even more fully than I stated it:

CASE XX.—In Nov. 1869, Mr. R. S., of Alton, Ill., consulted me because of the occluded condition of his nasal passages. On examination, I found both passages and the pharyngo-nasal cavity pretty well occupied by polypoid growths, all of them gellatinous in kind.

About two years before this he hawked out of his throat a large piece of what he took to be matter; but as he passed the same place next day he found that the matter thrown from his mouth was still sticking to a piece of board upon which it happened to fall, and that it was more red in color than when he spat it out of his mouth. This caused him to examine it carefully, which resulted in his finding that it had a fleshy consistency, demonstrating almost beyond a doubt that it was a polypus. The March before he came to me he had his first attack of asthma, which has been increasing on him ever since. first he had the attacks only on damp days, and about once in three to ten days. During the last two months he has not missed a week in which he did not have at least one attack, and sometimes two and three. His first visit was late in the evening, and as he had not had an attack of asthma for three days, he feared that he would have one that night before he could get home.

I took out two large polypi, one from each nostril. He took my advice and did not go to Alton that night. Next day, as he did not have his expected attack of asthma. I took out five more polypoid growths, four, varying in size from a pea to a hazlenut, and one as large as one inch and a half of the end of one's thumb, all of them predunculated, therefore, not very difficult to remove. At the completion of the operation he went home.

In one week he returned, saying that he had escaped the asthma, but had one or two more polypi in his nose, and wished these removed also. After taking out three or four small tumors, I thought that I would draw a wire loop through each nostril, to

make sure that I had the last growth.

My method of drawing the wire loop through the nostrils was as follows: I passed a white thread through a male catheter No. 5, so as to have about two inches of it to hang out of the eyelet; the catheter was then smeared with a little olive oil and passed along the floor of the nasal passage, keeping its point next to the septum nasi. As soon as the extremity of the catheter was in sight behind and below the velum, the thread was seized with a pair of forceps and drawn out of the mouth. This extremity was given to the patient to hold in his right hand. The catheter was now withdrawn from the nasal passage, of course leaving the thread in the passage, but drawn out of the catheter. This extremity of the thread was also given to the right hand of the patient who could draw on it just sufficient to prevent its going down the throat during the frequent acts of swallowing, which always follow this manipulation. The catheter was again threaded as before, but this time with a black thread, and was passed into the same nasal passage, but instead of its extremity being held against the septum, it was held as far away from it as possible. As soon as the lower extremity of the catheter was in view behind the velum, the thread was seized with the forceps as before and drawn out of the mouth and given to the patient's left hand. Then the catheter was withdrawn, which drew the thread through it, but not from the nostril. This nasal extremity was also given to the patient's left hand.

Now we were ready to attach a stiff No. 5 piano wire to the extremities of the threads that hung out of the mouth. To do so, a very short hook was made on each extremity of the wire, not more than the sixteenth of an inch in length; into each hook a loop, made on the end of each thread, was placed. As soon as this was done, then traction on the ends of the threads hanging out of the nostrils drew both extremities of the wire up behind the soft palate at the same time, and as the threads we introduced were, as much as possible, placed on each side of the nasal passage, the loop of wire must catch any growth that hangs vertically across the posterior nasal opening. As soon as the wire loop gave indication of its being engaged around a tumor, which was known by its being held within the cavity, both extremities of the wire were passed through a double canula. As the two ends of the wire were drawn through the canula, it, of course, passed into the nasal passage up to the tumor, which was then in the embrace of the wire. A continuation of the draught on the wire will cause it to act as an ecraseur, or traction on the canula and the wire may result in the tearing out the tumor.

After passing a wire in this manner through the right nostril, it caught hold of quite a large tumor, one that could not be felt with finger, nor even seen with the pharyngeal mirror. Its removal was accompanied with a good deal of pain and a large flow of

blood.

The patient remained in the city that night. The next day I examined him, but, the parts were so swollen, that I could not say whether or not I had removed all of the polypoid growths. That day he went home.

I did not hear from him until the following March (1870). Two days before this visit he had the first attack of asthma since the removal of the tumors last Nov. His visit this time was for the removal of supposed polypoid growths, which he thinks is the cause of all of his attacks of asthma.

At this time I was in the habit of injecting these growths with tineture chloride of iron, which had a

small quantity of the muriate of morphia in it, instead of dragging them out; so I injected five small tumors without giving him near as much pain as the extrac-

tion of one tumor by the forceps.

He remained with me for about three weeks; during that time I treated him for his chronic catarrh. I had urged, the fall before, that this inflammation should be reduced to a minimum, but as I could not give him a positive answer as to whether it would greatly relieve his asthma, he concluded to wait for a more favorable opportunity.

The effect of the injections on the growths were good, but my treatment was too irritating. This I learned from him years afterwards, as he did not tell me at the time. As there were several stumps of tumors left, he wished me to squeeze them so hard that they would slough away. This was done most

thoroughly. He went home that evening.

I learned from him by letter that he had quite a serious time, for the first five days after his arrival at home. His face swelled, and took on an erysipelatous appearance, but he had escaped his usual attacks of eathers.

tacks of asthma.

Feb., 1871, he came back to again have the returned polypoid growths removed. He had been free from asthma, but as his nostrils were getting more and more full every day, he felt that if the tumors were not removed his old enemy would be on him again.

At this visit I concluded that I had better clip off the middle turbinated process as much as possible. This was done; nearly a pint of blood flowed after the operation. The next day I took out twelve or thirteen growths, varying from the size of a large pea to that of a large hazel nut. The following night he had a slight attack of asthma.

I again urged on him the possible benefit of the treatment of his nasal catarrh, but his straightened circumstances would not allow him to stay in the

city.

After he went home he was free of the attacks of asthma for a few weeks, but it soon commenced again. This I learned by letter.

In the following Oct. (1871), he concluded to try the effect of the treatment of his catarrh, and stayed for some time in St. Luke's Hospital of this city. At this visit I made frequent attempts to remove the polypoid growths, as they had again returned. I treated his nasal cavities with cosmoline and the pinus canadensis comp., using about two and a half grains of carbolic acid to the ounce, which I now think was too strong. He suggested that I should leave the carbolic acid out of the mixture; this was done, but even the mildest treatment that I could institute produced no beneficial effect on the asthma. After remaining a few weeks he went home.

He visited me each spring and fall until Sept., 1875, at which time he went to Colorado. While there he kept, for my information, a record of his case every day from the 7th of Sept., 1875, to the 28th of Sept., 1876. This record I have in my possession, but it forms a poor recommendation for Colorado for asthmatics, although there is one place in which he says that he thinks, after he had been there about one

year, that he is a little better.

On Nov. 27th, 1876, he visited me again, to again have his polypoid growths removed. Throat, nostrils and pharyngo-nasal cavity were well blocked up with them. Their removal gave him one whole week's respite from asthma. At the end of this time, Dec. 4th, he came to suggest a more heroic operation than I have ever heard from a patient in my life; it was to cut open both alæ of his nose and then remove every one of the six turbinated processes. Of course I did not do it, but I have been sorry ever since that I did not follow his leading and remove every place of attachment of the growths, even to the risking of the man's life. Had I another case like it I would recommend and urge it.

In the spring of 1877, Mr. S. was induced to try the virtues of the nitrate of amyl. He inhaled a few drops; it checked the attack of asthma, nor did he have another attack, but instead of the asthma he was at once attacked with what appeared to be the formation of an abscess in one of his lungs, in which one I could not learn, but in three days this abscess bursted and the immense quantity of its contents, not being evacuated quick enough, strangulated him, so that before he could be turned on one side to allow it to flow out of his mouth he was dead.

It was he who first suggested to me that the attacks of asthma in his case were frequently owing to the irritation first starting in the nose. I think that there is much more truth in this than is now believed.

Of course I do not say that every asthmatic has nasal polypi, but every one of them that I have seen has nasal irritation, which if relieved, will relieve their attacks of asthma. This, I know from observations, made during the last ten years, on fully thirty patients, which, although not very numerous, is still sufficient to justify me in making this bold assertion.

It is not at all an uncommon thing for catarrhal patients to complain of the characteristic shortness of breath, that is always the precursor of an attack of asthma, which, indeed, is asthma in its first stage. This symptom I have nearly always relieved, during the last nine years by a thorough, yet mild treatment of the pharyngo-nasal and nasal cavities. Before I learned that mildness of the application was essential to success, my remedies would very frequently increase, instead of decrease the trouble.

Case XXI.—A little girl not over 12 years of age was brought to me on the 28th of November, 1876. The day before her visit to me her mother noticed her shortness of breath, which so closely resembled her brother's symptoms previous to his first attacks of asthma that she feared that she also would have this disease.

On examination, carefully made, only slight redness of the nucous membrane was observed; there was no enlargement of the tonsils, no excess of secretion; indeed nothing by which I could even say that her catarrhal trouble was more severe than is seen in almost every child of her age. But the symptoms given by the mother and the child were such that I

concluded to do nothing at the time, but asked that the child be brought back on the least indication of

shortness of breath.

I did not see the patient until the 27th of December following. She had eaten the night before a hearty supper, after which she had a severe attack of short breathing. In the evening at 8 o'clock she had a still more severe one. On examination it was found that the mucous membrane of the nasal passages were so swollen that she could with difficulty force any air through her right nostril, the left one being entirely closed. It was impossible to get a good view of the pharyngo-nasal cavity or the posterior nares, as she said that the mirror choked her as soon as it was passed into the fauces. I tried to spray the posterior and anterior nares, but it had but slight effect on the stoppage of the passages. Throwing a spray of vaseline into the pharyngo-nasal passages had a relieving effect on the throat and on the cars. Her statement that this spray relieved her ears was the first intimation that they were affected. By means of a syringe I forced about two drams of vaseline into each nostril. This had a very cooling effect.

Dec. 28th—She had a slight attack of short breathing last night. To-day she breathes through the right nostril more freely, but none at all through the left. After spraying the vaseline and pinus comp., as stated on page 251, I concluded to try the effect of a hypodermic injection of a 2 per cent solution of carbolic acid into the mucous membrane of the inferior turbinated process. I threw in about five minims. The sharp pain soon subsided, and was replaced by a numb feeling in the passage and on the outside of the nose.

Dec. 29th—Had no attack of short breathing; nasal passages both quite free. The patient was treated locally and constitutionally for about three months; then a few times in the falls of 1877 and 1878. Since this time she has remained in good health and has grown to be quite a large girl.

A patient who had a Severe Cough Occasioned by the Lodgment of a Foreign Body in the Nose.

Case XXII.—Mary —, of Indiana, æt. 17 years, was brought to me to be treated for a nervous cough, in August, 1874. The patient had been treated for three years, but the result was not beneficial. She had lost flesh very rapidly during the last three months, and now had night sweats, appetite poor, bowels irregular, sometimes quite constipated, at other times in the opposite condition, menstruation regular but quite scanty. She complained of severe pain in her right nostril, and in the right side of her head, and in her right arm down to the elbow. The right nostril was quite full of thickened mucous membrane and of muco-purulent secretion.

Inspection by the pharyngeal mirror revealed a puffy condition of the mucous membrane of the posterior nasal cavities, but especially that of the right side. I gave my opinion at the time that a polypus might be the cause of the closure of this cavity. Further examination proved that in this I was mis-

taken.

The local application of the cosmoline and pinus. canad. comp., as recommended on page 251, was made for three days daily. On her visit on the fourth day, on her blowing her nose, she caused some blood to flow; on inspection through the anterior nares, I saw a small gelatinous polypus. This I pulled out. After the subsidence of the flow of blood, and the spraying of warm salt water, I saw a colored substance, caught hold of it and brought it out. Then I saw that it was a large porcelain button. I asked her when she had put that in her nose. She had forgotten. Her mother did not know. It is altogether likely that it had been there ever since she was a small child.

At this stage of the treatment her father died suddenly, which took both mother and patient home. She did not return for treatment, but recovered completely from every symptom. Four Patients who had Hay or Autumnal Catarrh.

CASE XXIII.—Mr. —, a merchant of this city, at about 38 years. He consulted me in June. 1876, on account of a severe cold in the head. He had been a victim of hay fever for about four years. Each year this complaint commenced on the 20th of August.

Examination by the pharyngeal mirror revealed

nothing unusual except chronic imflammation.

I gave him ten or twelve applications by the spray producers Nos. 3, 4, 5 and 2. The last application started him to sneezing, which he feared would commence an attack of hay fever, but it did not. He was relieved of the cold in the head, but received no further applications, preferring to make a visit to the West for relief and relaxation from business.

Case XXIV.—Mrs. G., at. 52 years, a German of this city, consulted me in June, 1877, for excessive fits of sneezing. She would sometimes sneeze as many as eighteen to twenty times before stopping, but usually ten or fifteen times. These attacks would come on every fifteen minutes or half an hour. As she was quite a heavy woman, these sneezing spells wearied her very much. This attack commenced five weeks previous to her visit to me, and was constantly increasing.

Examination showed excessive redness of the mucous membrane as well as its being much swollen, both

nostrils being closed.

Vaseline and three drops of the pinus comp. was sprayed by the Nos. 4 and 5, and vaseline alone by the No. 2. These applications were made daily, for about two weeks, then every other day for three weeks. A laxative, diuretic and tonic were prescribed.

At the end of the first application her symptoms were very much ameliorated. So much so that she had no more severe sneezing fits. In two weeks all sneezing ceased, and every symptom disappeared after three weeks more of treatment. She should have had a few treatments the next spring to ensure

the permanency of the cure. But she, like ninetenths of patients, visit a physician for relief, not for prevention. She has had no relapse since.

Case XXV.—Mr. J. C., a merchant of this city, set. 49 years, consulted me for symptoms of hay fever in June, 1877. He has had these sneezing spells for three years, each year the attack becoming more severe. He had all the symptoms of hay fever in a not very aggravated form, but sufficiently severe to prevent him from attending to his business for the remainder of the day, so soon as the attack commenced.

Examination showed excessive tumefaction of the nasal and pharango-nasal cavities; his vocal cords were also very red.

One half drachm of vaseline and two drops of the pinus canad. comp. were made quite hot and applied by the spray producers Nos 4 and 5. For some time I applied vaseline alone with the No. 2, but I soon had to discontinue its use on account of the liabil-

He was relieved on the first application. These applications were made daily for three weeks, then every other day for about two months. Next spring, in April, he commenced to receive applications again, as he felt the return of the complaint. These were given, one every other day for about two months. Again next spring in April, he commenced to receive applications as he felt the return of the complaint. Seven were given, one every other day, which drove away his symptoms. He was treated in the spring of 1879, also; but not since, as he has remained well. Of course he received constitutional treatment during the whole time the local treatments were made.

Patients whose Chief Symptoms were Pain and Fullness in the Head, Despondency, Weariness, and Irritability of Temper.

Case XXVI.—Mrs. —, of Mo., æt. 48 years, consulted me in June, 1875, for a pain in the head, which was frequently accompanied by a fullness in the top

and back of the head. She had not lost flesh, bowels constipated, appetite variable. At the times that she had the best appetite she was most irritable and despondent. Caught cold continually, it made no difference whether she was in the house or out of it, she would take cold. She had a slight cough, but no

pain in the throat or chest.

As soon as she recovered from the pain in her head and ate heartily of a supper, her temper was ungovernable, she felt as though she could "jump on" her husband if he spoke to her; to have a stranger speak to her had no effect on her. She was frequently exceedingly sorry that she could not govern her temper; at other times she did not seem to appreciate her extreme unreasonableness and loss of proper self-respect.

This condition of things had been going on for about three months, when she came to me. Her husband had made up his mind that she was insane.

This made her seek treatment.

The pharyngeal mirror revealed a chronic inflammation in the pharyngo-nasal and nasal cavities. Her vocal cords were quite red, although she was not the least hoarse, nor had felt any disability in her voice.

She received treatment for about four months, and fully recovered from all of the symptoms of which her husband and she complained. She should have received other treatment, fall and spring, for several seasons, but up to the last time I heard from her—one year ago—she had remained well.

Case XXVII.— Mr. —, a farmer, æt. about 42 years, a bachelor, consulted me in October, 1875, for a slight sore throat. On inquiry into his history, I found that the throat symptoms were the least of his troubles. Since he was a boy he has been very liable to take cold in the head, which would result in excessive flow of mucus from the nasal passages and pain in his ears, although he has never had otorrhæa. He has been addicted to smoking and chewing tobacco since he was 10 years old, and has taken small quantities of whiskey since he has arrived at manhood. He has had some pains in his head for several years

and feels very weary all the time, but especially in the morning before getting out of bed. He has had great pride in the management of his farm, but when he found that he was so wearied, even after a night's rest, he became very despondent, even going so far as to settle all his worldly affairs preparatory to committing suicide. This fit of excessive despondency was in part, occasioned by his offending a servant whom he had employed for many years, the servant stating that he could not work for so cross an employer. Of late his eyes have given him much trouble, especially at such times as he has attempted to read. He has had more or less cough for twelve or fifteen years; this has increased during the last three months. For the cough he has taken cod liver oil almost every day during the last eleven years. At each attack of cold he has more or less pain and fullness in the back of his head; at such times he cannot even read the local items of the newspaper without discomfort, and his "power of mental appreciation was reduced to that of a child." He has had tinnitus aurium ever since he could remember, but of late it has been very much increased and sounds like the wind blowing through the leaves of the trees. In putting his tongue out, it trembles very much and is turned to the right. On walking he feels dizzy. Before last spring he could climb a ladder that he had in his barn, but at the present time he is sure that he would tumble off before he got up three rounds. During the last ten or eleven years he has lost all sexual desire, and thinks that this is the cause of all of his trouble. His lips feel thick and are hot. It is to this that he ascribes his inability to pronounce some words without especial effort, such as "before." His bowels have had a constipated habit for many years; his appetite is not good, nor does he sleep well; he ascribes this to the anxiety or dread of being burned out by discharged servants.

The examination by the pharyngeal mirror disclosed a dry, glazed condition of the posterior nasal and pharyngo nasal cavities, the pharynx and larynx; numerous blood vessels were visible, large and tortuous. Examinations of his lungs detected bronchial râles. Urine scanty, having a brick dust deposit in the vessel.

He received daily applications of vaseline and pinus comp. for about two weeks, then every other day for three weeks, then once a week to ten days until the following April, making seven months in all. He also took constitutional treatment, and had the application of the constant current—the anode—to the spine; the cathode to the lower end of the sternum. He also received fall and spring treatment up to October, 1878. His recovery was complete, as far as his urgent symptoms were concerned. He will require further treatment.

Case XXVIII.—Mr. —, of Illinois, et. 33 years, visited me March, 1874, with a view of being treated for enlarged tonsils. As he underwent the preliminary treatment, which lasted in his case nearly two weeks, to their being excised, he informed me that, for at least one year, except during the last week, his temper has been so very irritable that it was the occasion of great distress on his part, as well as on the part of his near relatives. He frequently found it impossible to give an answer that was not really insulting to his wife and his father, especially, when inquired of concerning his health. He said that he got in a chronically cross habit of "chopping off" his replies, so that they dreaded to speak one word to him.

After his tonsils were removed, he took about three months' treatment, and received fall and spring treatments for three years. His irritable disposition

soon entirely disappeared.

Patients that had pain in the eyes from reading and studying.

CASE XXIX.—Mr. J. F. R.—æt 24, consulted me December 4th, 1872, for pain in the head. In August 1873, he wrote the following history of himself:

"I have, since I was twelve years of age, been subject to frequent attacks of sick stomach accompanied by a light dizzy feeling in the head, brought on al-

ways by study, reading or writing or anything that required the constant use of the eyes or application of the mind. While in this condition, the nerves of my eyes were so much affected that I could not read a half dozen lines without resting them, by shutting them rather tightly. From this cause I was unable to attend school with any degree of regularity, and in fact after two or three years, had to quit school and abstain almost entirely from reading and study for years. During this time I was apparently healthy.

"During this time I frequently consulted physicians as to the cause of these feelings, but without success, as I was, up to my eighteenth year apparently with-

out disease—the perfect picture of health.

"Have been under medical treatment for disease of the throat for five or six years without finding out that I had a case of Catarrh of long standing until I came to you last December. Have been much benefitted by your treatment, and have become convinced that the feelings heretofore unexplained, come from said catarrh.

"Since I have been under your treatment, I have not felt the light dizzy feeling in my head; but my

eyes are still a little weak."

When first seen, his throat was so sensitive that it was with much difficult and patient effort that I could get a view into the pharyngo-nasal cavity. I found that I had to spray his nasal passages with a solution containing one-fourth per cent. of carbolic acid. After he had inhaled about one dram of this mixture through his nostrils, into his lungs, his throat was not quite so sensitive, but I did not get an opportunity to give him a good application until he had visited me about ten times.

I made the usual applications to his throat and nasal passages after these visits.

His treatment lasted for about seven months. At first he was treated every day for thirty-three days. Then every other day for three weeks. The remainder of the time, once in from five to ten days, as he felt that he required relief from the symptoms.

At the end of this time he was relieved of all of his dizzy sensation and his eyes had so far improved that he could read without difficulty, yet felt the ef-

fect of long reading on his sight.

He received twelve treatments the next fall. One, once or twice a week. The next spring he was not treated, but should have been. After that time he was treated fall and spring until May, 1879. At this time he had completely recovered in every respect, and gained in weight from 138 to 195 pounds. I treated two of his brothers and a sister, whose eyes were affected in a similar manner to his own, but not in so aggravated a form. The only application that I made to the eyes of these patients, was plain vaseline. This was applied by themselves at such times as they thought it was required, the indication for its application being any unpleasant sensation either in the eyes or on the lids.

CASE XXX.—Miss ——, æt. 21 years.—"As far back in my childhood as memory traces, perhaps at the age of five or six, I recollect being troubled with catarrh in my head, but suffering no pain. My voice was clear and strong.

"At the age of thirteen or fourteen, being very fond of music, I sang a great deal and think strained my voice, which changed its tone. Still I do not remember any pain except what I realized from having this pleasure denied me.

"A year later I experienced a little pain in my eyes which lasted but a short time, then passed away leaving no trace of its presence and having had nothing done for it. In fact, I did not complain; as I thought I had strong eyes, and did not wish to undeceive myself or any one else, indeed I made myself believe it mere imagination; but I was conscious that

there was trouble, and had to sit and hold my eyes. "Sometime after this I entered the normal school and apparently had strong eyes. The studies here being difficult, or rather, having so much to do in so short a time, I studied night after night until twelve or one o'clock and sometimes later.

"I suffered almost constantly with pain and aching in eyes and head from this time on, and have never been entirely free from trouble with them since. I did not notice any difference in sight however, during the first year of this trouble; but they were quite

sore to the touch and pressure.

"In the second year I had occasion to look at something which required the use of but one eye. Having closed my right eye, I found to my amazement the left eye was near sighted. When this occurred I never knew. It seems to get more near sighted each year. I have realized it more in the past year or two than ever before. During the past summer I had a severe spell with this eye which lasted for two or weeks. Humor coming out of the eye every day, and suffering intense pain. Pressure on either side of the nose near the eye, caused pain in that eye on which it was used.

"After suffering with my head and eyes for over four years, my throat began to trouble me. This was in my third year of teaching. I had a severe spell of sore throat this year which lasted for three or four days, after which it seemed perfectly well. Since this I have had one or two spells-each accompanied with a chill and fever-every year until the last school year. In the beginning of my fourth year of teaching, having taken a severe cold, it settled in my throat, and and I lost my voice for several days, and could not speak above a whisper during this period. From this time I have been troubled with constant irritation, dryness and weariness in my throat. I can neither talk, read nor sing for any length of time without irritating it very much. Ever since this attack my voice has been becoming more husky.

"All colds I have ever taken seemed to settle in my head, and after taking a heavy cold I would suffer intensely with my head and eyes. In these spells I have always experienced a severe pain in the top of the head where the parting of the hair is made, also above the eyes and aching in the eyes. Whenever I suffered with this pain in the middle of my head, my eyes always troubled me at the same time. At times my eyes seemed swollen and the sensation was such as one would feel if the skin from the eves were drawn and held back for some time. My left, or near sighted eye always troubled me most. For a year or more there has been a hair floating before it which at first made me quite nervous, and now continually annoys me. Quite frequently a pain begins at the angle of the eyes, and passes through the bones over them. I cannot read or sew steadily without pain in the eyes. Since my throat first troubled me, it always suffered from these colds in the head and is quite predisposed to cold. Indeed it has become so sensitive I quite frequently know whether it is damp or wet, on waking in the morning by the sensation in my throat; at which time it feels swollen, dry and rough.

"One year ago last May, my throat began to get sore on the right side; I burnt it with iodine, and thought it was well, when suddenly it became sore on the left side but lower down. This attack lasted four days, after which my left car festered and discharged humor and has never felt well since. During the past summer I have had a humming noise in this ear, which extended through the left side of my head."

The above history was given to me about three weeks after she began treatment. Her's was a case in which the nasal passages were so greatly involved as to overshadow for the time being all other symptoms affecting the eyes, ears, throat, head, heart, and stomach. I learned after she had been under treatment about three months, that she had palpitation of the heart at such times only, as she had excessive pain in the throat and head at the same time, and had dyspepsia when she suffered most from her eyes and her ears.

Her pharynx was not at all sensitive, so that I had a very good opportunity to give her effective applications from the commencement of her visits.

The appearance of the pharyngo-nasal cavity was of a dark, bluish red; the whole surface, as well as the posterior nasal cavities, was coated with a tough, adhering muco-purulent secretion. The vocal cords were as red as the surrounding mucous membrane, yet this membrane was not nearly as congested as was the membrane in the cavity above. The turbinated processes were greatly hypertrophied, so much so, that always one of the nostrils were closed during the day, while, just so soon as she retired for the night, both nostrils closed on assuming the horizontal position, and remained so until she arose. The conjunctiva of both lids of both eyes had an inflamed appearance. The ophthalmoscopic appearance of both eyes indicated a hyperæmic condition, the left eye being the much more affected one. The blood vessels were fully three times as numerous as they should have been. Both membrana tympana were excessively concave. The hearing in the left ear 12 with the watch, yet her hearing for conversation was but little affected, showing that the watch is far from being a good guide as to the usefulness of an ear for usual hearing; in the right ear the watch was heard 60.

The following is the course that was pursued in the local treatment:

Oct. 5, 1872.— The Catheter Nasal Douche was employed to clean the nasal cavities, as the previous use of the spray producers proved ineffective. About one-half pint of warm salt water (j3 ad j O.) was used in each nostril. This had the effect of cleaning the mucous membrane, but caused some headache.

The douche was not used again, nor did the nasal passages require it, as the spray producers were sufficiently effective in cleaning and applying the remedy at the same time. The remedy applied by the spray producers, Nos. 2, 4 and 5 was:

B	Aquæ
7	Aquæ
	Am. Hydrochlorasgrs. x
	Acidi Carbolicigrs. vij ss
M.	

Of this, I sprayed about a half dram into the pharyngo-nasal and posterior nasal cavities. It produced some pain, proving that it was too strong in muriate of ammonia. I would now prefer the prescription as given on page 251. However, this application was made every other day for about two weeks—modified in quantity by the degree of sensation or pain it produced—then twice a week for twenty weeks, then once a week for five months longer.

The tinnitus was relieved by the application of the constant current, the negative pole being placed on the lower extremity of the sternum, and the positive applied to the ear, by means of an car electrode made of hard rubber, the meatus being first filled with warm salt water (3j ad Oj). The intensity of the current was made so low that it could scarcely be felt when first applied, and it was then increased until the tinnitus was obliterated—which was usually the effect—or was changed in tone to a lower sound, but at no time was there the least dizziness produced, or any other disagreeable symptom. Constitutional remedies were used during the whole course.

The immediate result of this course of treatment was to greatly ameliorate all of her disagreeable symptoms. She was after this long course treated at

such times as she took a cold whether in the fall or spring. It is now fully two years since she received her last treatment. Undoubtedly she will require other treatments should she take cold. From 1874 to 1876 I applied cosmoline to the anterior nares. From October, 1876, up to the time of her last treatment, I have applied the prescription as given on page 251. This she said was a great improvement on the local application as given in 1872.

CASE XXXI.-Mr. J. I. D. æt. 31. "I herewith detail to you the symptoms of the disease with which I am afflicted. I will probably feel bright and well for a week, cheerfully perform my duty, and be pleasant in disposition, when, all of a sudden I feel a pain in my forehead extending on the top, sides and back of my head, at the same time my right eye is affected, and becomes unsteady. When I get this pain, my mind is wrapped in a stupor, and my memory not very fresh, and a humming in my ears at intervals. I then feel despondent, and it seems that I am indifferent to every thing, and at such times feel uneasy, and I try to be cheerful but of no avail-as soon as the pain in my head leaves me I feel as if I had awoke from a dream, feel buoyant, work with pleasure, and then hope and wish that I may never be troubled with this pain again. I have in the foregoing stated to you, as near as possible, how I am affected."

This patient visited me on Sept. 9, 1875. His prominent symptom, given to me at the time was a difficulty of breathing through his nostrils, and frequent headaches.

His treatment consisted in the application of the spray of the pinus canad. comp., using about two and a half grains of carbolic acid to the ounce, (which is too strong), and the cosmoline, as well as constitutional treatment, consisting of a tonic, a laxative, and a diuretic.

He fully recovered from all of the symptoms of which he complained, even after the third weeks' treatment, but received treatment for fully six months. The last three months of this period, he received an application but once a week. Since that time he has received from two to six treatments almost every fall, and will require these applications in all probability every fall while he lives. At present, and since the spring of 1876, he enjoys excellent health.

CASE XXXII.—Mr. E. of Springfield, Ill., says that reading always occasions the pain in the back of the head and neck to increase, and if he persisted in reading believes that his mind would be affected.

Mr. E. was 78 years old when he visited me on April 3d, 1876. He complained most of the pain in the head and nasal passages, and of excessive noise in his ears.

The catarrhal inflammation was treated as indicated on pages 251 and 252. The tinnitus was treated by electricity.

The prominent symptoms, such as the pain and fullness of the head, was at once relieved, and the tinnitus mitigated a little. This is all that can be expected in patients of this age. He received treatments for about three weeks.

Patients who have pain in the top of the head and in the arms and hands.

Case XXXIII.—Mr. C. T. R. a printer æt. 28 years, visited me on Jan. 15, 1875. "Two weeks ago tonight I became intoxicated; staid out most of the night 'making calls.' When I got home I was very tired and laid down on the bed with my clothes on. Next morning I found on washing my face that something was the matter; looked in the glass and saw

my mouth drawn to one side; I called on a doctor, who told me that I had paralysis of the left side of my face; he gave me a prescription; this I did not take; called on another physician, who examined me, then gave me a prescription to operate on the bowels. The medicine did not operate, but caused pain in my head. This pain continued to increase until it got so severe that I could not comb my hair. I have not combed it since last Monday (five days ago); since yesterday morning the pain in my arm has got so very bad that I have not slept, although the last doctor that I went to gave me an injection of morphine in the arm. Every time I shut my teeth together it hurts me on the top of my head. I feel as though I must get rid of this; if I don't I'll jump off the bridge. I tell you I will."

The first application made by the spray producers Nos. 4, 5 and 2, using vaseline and pinus comp. (three drops), used as mentioned on page 251, relieved him of much of the pain in the head. In two weeks—daily applications being made—every one of the promi-

nent symptoms had disappeared.

Of course the cure of such a case could not have been completed in this short time. The patient did did not make another visit.

CASE XXXIV.—Mr——æt. about 30 years consulted me in May, 1876. The following is the history, given at the time of his visit:

"About five or six years ago (in Dec. or Jan.) I contracted a very severe cold, that finally settled in my

head.

"The usual discharges from the nose followed. The secretions were somewhat profuse, of a yellow color, and continued right along after the cold had to all other appearances left me. In the course of some six months, I began to feel a dull and seemingly deepseated ache or pain in the lower part of my forehead and between my eyes. This pain was quite severe at times, though more deadening than acute, and apparently caused a rush of blood or unnatural heat to my head and face. It would continue thus from six to twenty-four hours, during which time my eyes were

more or less red and weak, and then pass away for several days (eight or ten) though it seemed never to leave me entirely. I had suffered a great deal from headaches since childhood, and was so accustomed to them that I thought little about the pains.

"Secretions similar in character to those mentioned continued. They were more profuse at some times than at others, and better in summer than in winter. The headaches continued about the same, and were generally severe one night or day in each week.

"For some three years there seemed to be little change, then a hard lump of clotted matter would occasionally come from the head down into my throat, and usually be annoying for an hour or two before I could by a violent effort remove it. This would oc-

cur once in seven or eight days.

"From about one year after the first symptoms mentioned, until Feb. last, I was not at any time aware of having taken the least cold, unless a slight increase in the discharges from the nose may have indicated it. But no cough even appeared, though I was more or less exposed, and before that time any cold that I took, almost invariably settled on my lungs, and very severe cough for several days was the consequence.

"Within the past two years there has been no perceptible change either in headaches or the secretions. I have, however, often felt a dizziness and dull aches in my head, and at such times there seemed to be an overdue rush of blood or heat to the parts.

"The severe headaches mentioned continued all the time, and generally came on Saturday or Sunday of each week. I found that at such times a large dose of salts would apparently relax the circulation and relieve me considerably, but only for the time."

This gentleman had the usual excessive chronic congestion in the pharyngo-nasal and nasal cavities. The first application relieved him "of fully half of the painful symptoms," as he expressed himself as he was leaving my office. The usual local and constitutional treatment was continued for about three and a

half months, and resumed for a few weeks in the succeeding falls and springs. I expect that he will require these treatments nearly all his lifetime.

Patients that have vertigo and symptoms of epilepsy, and complained of their memory becoming defective, and their mind confused.

Case XXXV.—Mr. Wm. H., of Cairo, Ill., et. 19 years, who was sent to me by another patient, Feb. 18, 1873, complained of excessive dizziness. He says:

"I felt dizziness about eighteen months ago, or a little longer than that, from stooping. I was then chewing tobacco about six months, and chewed it vigorously, about one and a half ounces of fine cut a day; soon after this I commenced increasing the quan-

tity until I disposed of two ounces daily.

"About six or eight months ago this dizziness grew worse; did not do anything for it, thinking it a common thing. About six weeks ago I began to think it an uncommon thing. I took medicine from my physician to operate on my bowels, also a tonic and "nerve medicine." My physician thought that the valves of my heart was the origin of the trouble, and as soon as they acted normally-which they would do in a week or ten days. During the last three years, it may be longer than that, I had felt a pain in the upper part of the throat (soft palate), for which I used to eat licorice. Four weeks ago I had a little pain in the left eye, at this time I looked in the looking glass, and noticed that the pupils of my eyes were larger than natural, my mother then observed the same, and that one pupil was larger than the other, that of the left being the larger, (now Feb. 28, 1873, the right is the larger). On the 15th of Jan. I felt dizziness in the head; on the first shock, I had a blindess of the eyes, every thing was whirling around. (I was in bed then, and had been lying on my back, and felt it as I raised up.) Ever since New Year's I had a cold in the head, and my throat felt raw, also, had headache, I was costive at the

time. About three days (Friday) after the first spell I had a second shock, this happened while weighing hay; commenced right after dinner, and felt a peculiar feeling the remainder of the day. After I got asleep, I felt as if I was falling-in a dream-felt the same way on Saturday; on Sunday I felt worse, had but little headache, on this day (Sunday) I felt numb and yet frightened, tried to write a little and could not, looking at the paper increased dizziness. As my bowels were then constipated I took a bottle of citrate of magnesia. Felt about the same on Monday and about two weeks, about this time I began to feel better. Feb. 1st I concluded to go to work in my father's store, and as they would be busy on this day, I thought that I would undertake to do some collecting, but the excitement of this caused me to become worse.

"Felt the same for about two weeks; then I felt a little better, that is, the peculiar feeling was not constantly present, but had intermissions of feeling better. I stopped the use of tobacco about the 19th of Jan., 1873. (I had not felt well since Jan. 1st, 1873. I had a sore throat and felt husky and dry, had a cold

in the head, and stopped-up nose)."

Feb. 18, 1873. When he presented himself he looked very much frightened, the right pupil was much larger then the left; but both were enlarged beyond the natural size. He complained of a continual dizzi-

ness and numbness.

The pharyngo-nasal cavity of this young man had an ædematious appearance, after it had been cleansed of a large quantity of secretion. The soft palate was so debilitated that he could not raise it so as to close the passages from the pharynx to the pharyngonasal cavity, and frequently fluids and solids would pass into the nasal passages.

As his hair was very light, showing a weak mucous membrane, I had no hesistancy in saying that the tobacco had caused most of these symptoms, by pro-

ducing the excessive congestion.

In the treatment of this case, I made but little headway, as I did not have the vaseline or cosmoline to combine with the pinus canadensis and carbolic acid. Every application seemed to help him for the time being, but that was all. I had him under my care for about six weeks, then gave up the case. Had I such a case now, I could in the six weeks have driven away every unpleasant symptom. I have placed the history of the case here to show the symptom of some catarrhal patients.

CASE XXXVI.—Mrs. A. V. J., æt. 22 years. "While suffering from neuralgia or catarrh I have frequently experienced a sensation, which led me to fear that I would lose control of my mind. This feeling was always accompanied with severe headaches. The immediate cause was usually mental trouble or intense application of the mind either to studying or reading. The worse attacks were invariably in the night; probably because there was then less opportunity for diverting the mind, which seems to be the only means of finding relief. The sensation would come and go, but the attacks never continued for more then a few hours."

CASE XXXVII.—Mr. I., æt. 58 years. "Inability to keep the mind fixed on any one thing for any length of time, or to remember for even a short time, anything read, only a general idea remaining. Thinking momentarily of every thing. Mind always busy, but mostly with fancies; very fanciful."

CASE XXXVIII.—Mr.—, æt. 78 years. "Wonderfully mixed up in my own ideas, easy to forget what I want to say; sometimes before I get through with my question, I forget what I expected to learn from its answer. Sleep well when I go into a cold bed-room, but it causes me to cough. Fever every day from 8 o'clock in the morning to 4 in the afternoon. During the fever I could not write even a line in a letter or make out a bill."

I treated the above three cases in the fall of 1877. The appearance of the throat, pharyngo-nasal and nasal cavities resembled each other very much, except as to the number of blood vessels that were visible. In the youngest case, the vessels were not very large nor numerous, while with Mr. L. they were as numerous, nearly, as in the oldest case, but in the oldest patient the vessels were more tortuous and irregular in caliber.

They all received about the same treatment, and were relieved of their prominent symptoms early in treatment. Mr. L. is still under treatment, that is fall and spring. The other two patients have left the city.

Case XXXIX.—Mr. N., æt. 29 years, consulted me in April, 1874, for catarrh of the nasal passages. The following is his history: "I have been troubled with the catarrh more or less for the last eight or ten years; it troubled me most during the last six years, all the time growing worse—one side or other of my nostril stopped up all the time, and a continual dropping of secretion into my throat, causing me to hawk and spit enough in the coarse of a year to cover a ten acre lot.

"Nearly five years ago I went down into the caisson under the East pear of the Ill. and St. Louis Bridge, I think much to my injury—going through the airlocks caused me severe suffering—the dense pressure causing my head to feel as t'were between a vice with plugs in my ears, with darting pains and aches, while in the caisson though not as painful, was like a man intoxicated, and hard to keep my equilibrium after coming out. For some time I discharged secretions and blood from the mouth and nose—ears ached—and were for months extremely sensitive to noise, being near the strike of a hammer; it seemed to pierce my head like an arrow. The catarrh has troubled me much more since this experiment. When I get a little cold it gives me a heavy headache, and the dis-

charge and choking is almost intolerable, at times becomes a little offensive. Have tried various remedies but to no purpose, used four dozen bottles of Sage's Catarrh Remedy, eight bottles of Pierce's Discovery; for nearly a year I used carbolic acid by snuffing up the nose. I am troubled very much by an expectoration that seems to rise from toward my lungs that often makes my voice husky, and almost impossible to give an utterance.

"But worse than all this, on last Sunday morning, while I was lying in bed I had a succession of the most frightful sensations that I ever experienced in my life, and I have experienced them again on Tuesday and Thursday mornings last, but not so severely as on Sunday morning. At that time I think I must have been unconscious for some minutes, as I remember that some one was at my door, but when I came partially to my senses, I seemed as if I was falling or rolling out of bed. I grabbed the bed clothes to prevent falling on the floor. I also noticed that the house seemed to be rolling over from right to left. After this sensation had partially subsided I attempted to arise but at once became unconscious, and when I awoke I found my heart palpitating very rapidly, and my body bathed in perspirstion. On the next Tuesday and Thursday I again underwent the same symptoms but of a much milder form, and this morning I was again attacked. After I was up and dressed I felt like a drunken man. I have used tobacco ever since I was a boy. My memory is now so poor that I can hardly attend to my business, but this has only been during the last five or six months. I am afraid that I shall be paralyzed, and keep stamping my feet on the pavement to know that I have got feet."

This peculiar case was treated without giving relief for about two weeks. He then went to New York city and was treated there, but nothing that was done for him relieved him of his most troublesome symptoms. In August following he visited Europe and stayed for some weeks at Ems; returned to this

country in November and spent the winter in Florida.

On April 9, 1877, he again visited me. His symptoms were not much altered, and thinks that he has unconscious spells at night. He was utterly unable to attend to any business.

The appearance of his nasal and pharyngo-nasal passages indicated long continued and excessive congestion, Since his return from Europe he has found it necessary to use glasses to enable him to read.

I made applications as indicated on pages 251 and 252. On receiving the first application, he expressed himself as relieved of much of his distressing symp-The applications were continued daily for about four weeks, then every other day for about four months. After this I made applications at such times as he felt that he required it. He is at the present time under treatment. I also prescribed a laxative, a tonic and a diuretic as constitutional treatment. The constant current of electricity was employed, placing the negative pole over the lower end of the sternum, and the positive passed up and down the spine, from the base of the brain to the lumbar These applications were made once a vertebræ. week.

The result of this course was to so far improve him, that he has had none of the prominent symptoms during the last twenty months, while his memory is not equally as retentive as it formerly was, yet it is very much improved, and I believe that in four or five years he will have entirely recovered in every respect, but in my opinion he will still require a few treatments, fall and spring, for the remainder of his life, to maintain this good health.

Patients whose principal symptoms were Dyspepsia and Sleeplessness.

CASE XL .- Mr. B., of this city, æt. 39, merchant, consulted me in March, 1875, for excessive sleeplessness and dyspepsia. He had taken a bad cold in the head, but had recovered from it, except that since his cold has left him, his food disturbed him much, and at the same time he could not sleep, unless he went to bed hungry. He had for the last few months experienced some reverses in business, which, added to his physical ailment, increased his mental anxiety. His memory was much affected; he could not tell from his books how his business was being conducted. His pulse was 102; temperature 100° in the mouth. He had now and then some pain on the top of the head, and at such times a slight palpitation of the heart, but these were so slight that he would not have mentioned them had he not been asked concerning them. After eating he had a great fullness and heaviness in his stomach; these symptoms were much more aggravated after his supper than after other meals. He had been a fleshy man, but now he was quite emaciated, having lost nearly thirty pounds within the last two or three months. He had taken hydrate of chloral and bromide of potassium to induce some sleep, but it did not procure the desired relief.

After he had one application by the spray producers Nos. 3, 4, 5 and 2, he stated that his head felt cooler, although he had not felt that it was warm before the application. He received forty-five treatments at the first course. One year from that time, six more treatments, then in the spring of 1880 twelve additional treatments. Had he been treated at each successive fall and spring, he would not have required so many treatments last spring.

Case XLI—Mr. H., a lawyer, at. 42, consulted me on April 5th, 1875, for sleeplessness and a fullness in the head, but the latter, he considered, was not of much consequence, as he had this ever since he was a

boy. His bowels were constipated; appetite moderate; felt weary, physically and mentally, which caused him to have despondent thoughts concerning his business, although he was in very affluent circumstances. He has tried the effect of three or four drinks of whiskey, but this drove him almost crazy; he felt as though he was compelled to kill somebody or himself.

The pharyngeal mirror revealed a complete network of blood vessels enlarged to the size of horse hairs; these extended down the pharynx, over the tonsils, the velum, the epiglottis, also up into the nasal passages and out the anterior nares, which gave his nose a slight reddish appearance.

He received forty-eight treatments in all; the first eight were given daily; the next twenty-two every other day, the remainder at such times as he felt as though he ought to be treated. He received two treatments the next fall, and four treatments in the fall of 1878. Like the large majority of my patients, he never comes for the fall and spring treatments, unless he feels some of the old symptoms return.

CASE XLII.—A widow lady, æt. 52, complaining of sleeplessness and pain in her left arm and the left side of her head, consulted me April 28, 1876. Her bowels were very constipated, not having an action oftener than once in eight to eleven days; appetite poor, otherwise appearing in excellent health. The pain in the left side of the head was very bad; when the pain in the arm had subsided, and vice versa, when her head pained her, it seemed as though the whole head was "possessed by a multitude of noises;" this kept her from sleeping. She could not lie on her left side, because, as soon as she did so, her heart would commence to beat so hard that it would cause pain in her left lung. Her throat had been dry every morning from her childhood. Until lately she had been remarkably easy in taking cold in her head.

Examination revealed enlarged tonsils and uvula, follicular pharyngitis, long standing pharyngo-rhinitis; not only this, but I found that she was habituated to the daily use of tobacco and opium.

Twenty-eight treatments completely relieved her of all of her prominent symptoms, but the opium habit remained with her. She has received fall and spring treatments as regularly as the season comes around, which keeps her in excellent health.

CHAPTER XXXII.

REPORTS OF CASES CONTINUED.

PATIENTS SUFFERING MOSTLY FROM DISEASE OF THE LARYNX, BUT HAVE DISEASE OF THE NASAL PASSAGES ALSO.

If the physician was guided by the indications of the location of disease as given by patients, this class of complaints would be considered paramount to all other affections connected with the superior portion of the respiratory tract. The reason of this is that a continued cough, with a yellow expectoration, always has an alarming effect on the imagination, and suggests "consumption," a disease, in the minds of the laity, that means certain death in a few years.

At the commencement of the cough, there is but slight if any sensation in the larynx that calls the patient's attention to it, but in the course of time he experiences sensations in it and lower, even as far as the middle of the sternum, then he is thoroughly aroused. At this time, when inquired of concerning his complaint, he points to his larynx, and states that his sensations commenced there, and afterward went down towards his lungs. Now, if the laryngoscopist is consulted, he will look down into his throat; although he will not see much to account for the symptoms just given him, he may, and in all probability will make an application with a sponge or brush, or give him "an inhaler," or he may recommend a teapot, into which he directs the patient to place a little hot water, a few drops of tincture of iodine, and a

little carbolic acid. Had this physician seen on the outside of the throat or on any place of the chest, an inflamed spot, that he knew from its appearance had been in this condition for many months if not years, all the blood vessels over it and surrounding it in an enlarged and tortuous condition, would he not have endeavored to have traced the throat complaint to this diseased spot, especially if he knew that the two parts were very intimately connected by important nerves and blood vessels? If, in the examination of the throat, he had turned the reflecting surface of his mirror upward, he would have seen in every one of such patients, a grade of inflammation that would at once suggest its being the cause of the irritation in the larynx. It is passing strange to me that this most important region of the respiratory tract should have been so long neglected by the numerous array of close observers, and when the subject was mentioned to some, it was suggested, that to place the diseases of the nose paramount to, and affecting the system to a far greater degree than the diseases of the larynx, would be degrading to laryngology. Of course this is a mistake. I believe that the diseases originating in the nasal passages will soon receive the recognition of the profession, and be placed paramount to all others affecting the respiratory tract.

In the cases given below, the local applications were never directed into the larynx. None reached this organ, except so much as was inhaled from a horizontal spray producer. That there are cases that require that the spray should be directed down into the larynx is not denied, but they are very few in number.

Patients Troubled with a Harrassing Cough.

CASE XLIII.—Miss F., of Ill., æt. 22 years; black hair; consulted me Jan. 29th, 1875, for severe cough and pain in the chest, accompanied by a slight show of blood in the expectoration. Had lost flesh during the last three weeks; appetite poor, bowels constipated, catamenial functions irregular, pulse 85; temperature in throat 100.°

Examination by the pharyngeal mirror revealed a large amount of muco purulent secretion in the pharyngo-nasal cavity; larynx quite red, vocal cords red-

dish.

Local application of vaseline and pinus canad. comp. (3 drops) as mentioned on page 251, was made by the spray producers Nos. 4, 5 and 2. Relief followed this application; a tonic and laxative was prescribed; in three weeks she gained 12 lbs.

In seven weeks she made her last visit. She has remained well since, and has gained nearly 20 lbs. in

weight.

CASE XLIV.—Mrs. L., of Ind., æt. 32 years, consulted me in the spring of 1877. Has had cough for about six months; during this time has taken several gallons of cod liver oil, (which was as beneficial to her hands as to her throat—the seat of her complaint). Has lost flesh; formerly weighed 130 lbs., now weighs 110 lbs. Temperature in mouth 99°; has had night sweats for about three weeks; bowels constipated, otherwise regular.

Examination of the pharyngo-nasal cavity detected long standing inflammation and quite a quantity of tenacious secretion. The epiglotis was swollen to about twice its usual thickness; the arytenoids but slightly, if any affected; vocal cords quite red.

Her treatment was quite similar to the above case. Immediate relief followed the first application; in three months she had gained 22 lbs. She had in all about forty treatments at this time. During the fall of this year, she received six treatments, and the following fall, three more; since which time she has remained well.

CASE XLV .- Mr. -- æt. 39 years, from Mo., visited me March 13th, 1876, on account of a very severe hemorrhage from the lungs, as he thought. He was accompanied by his wife, as he feared to travel alone. As he came into my office with his head held down to his chest, and looked up from under his eyebrows, I was struck with the position of his head, which he persistently maintained while giving a history of his case. It was as follows: "On last Saturday after I came from my work, (blacksmith), I commenced to wash my face, and while doing so, my head being stooped down, as I washed with the pan on the ground, I tasted something saltish in my mouth; I spat it out and saw that it was blood. I finished washing my face, but before I had done, I think that I had spit some half dozen times; every time there was blood in the spittle. I sat down awhile, but the blood commenced to drop out of my mouth; so I sat holding my head with my hands between my knees. My wife went for a doctor, who gave me a great many different kinds of medicine, but nothing stopped the dropping of the blood. I sat there all night, and with the saliva that came from my mouth, and the blood, the bucket was nearly quarter full. I think that the only thing that helped me, was the placing of a bunch of keys on the back of my neck. The next morning a doctor called; he wished to have me hold up my head to take a look at me. I was afraid to look up, but did so to please him; right away the blood commenced to run from my mouth again, and did not stop for nine hours. By this time I was as white as a sheet."

He was still very pale from the loss of blood. I at once judged that the hemorrhage came from the pharynx, as he experienced a sensation of tearing or drawing to a slight degree on raising his head.

Preparatory to making an examination, I got my cotton and the solution of the persulphate of iron ready, and having placed him in a favorable position, I directed him to slowly raise his head. So soon as he had raised it, so as to place the opened lower jaw on the horizontal, I saw a small drop of blood start

from a crack, that the raising of the head made in the black hardened clot of blood adhering to the posterior wall of the pharynx. I instantly placed a pledget of cotton, holding a little of the solution of iron, on it and then continued my examination. There was no blood clot in the larynx; his voice had not been affected, nor were there any clots in the mouths of the Eustachian tubes, but the whole of the pharyngonasal cavity was very much inflamed, and many of the blood-vessels were much enlarged, tortuous, black and blue. Strange as it may seem, this man had never had any symptoms that would in the least indicate a pharyngo-nasal catarrh, yet the membrane and vessels were in as abnormal a condition as that of the worst case I had seen during twenty years' observation of the diseases of this part of the body.

I at once sprayed the pharyngo-nasal and nasal cavities, but at the entreaties of the patient did not touch the pharynx. No hemorrhage took place.

On the third treatment I cleaned off the elot on the posterior wall of the pharynx, without causing hemorrhage. After twenty-three treatments, each of which was given every other day except the first five, which were given daily, he returned home. I have heard from him frequently. He has had no return of the hemorrhage.

CASE XLVI.—Mr. M., a lawyer, at 28 years; light hair; always has been spare built; consulted me March, 1875, with regard to his lungs. His mother and her mother had died of consumption. He complained of a frequent cough and some pain in the chest. During the last three weeks he had frequent attacks of palpitation of the heart; had formerly been very liable to take cold in the head, at which time he had severe headaches; his bowels were constipated; appetite capricious. Examination proved that his disease was in the pharyngo-nasal cavity alone. The treatment that he received proved that this was correct. In three months he gained twentyeight pounds in weight, and every symptom of disease that he complained of had left him.

A patient who had Pain in his Throat and Chest, and had Hemorrhage from the Throat (and Lungs?).

CASE XLVII.—Mrs. —, of Illinois, commenced treatment on the 1st of Ang., 1872. The following is

her history up to Nov., 1874:

"The first distinct recollection of my throat troubling me was in 1859 and 1860 when I was off at school; the halls and rooms were large and cold, and from this I date all my trouble with my throat and head; I had at that time a constant tickling and irritation in my throat, and was constantly clearing my

throat, and had a short dry backing cough.

"After leaving school I do not remember that I ever had any serious difficulty with my throat until the year 1872. I was one morning canning peaches, when I had a peculiar cough, differing from anything I had ever experienced, and I commenced sptting blood, about one teacupfull; at this time I had three or four different hemorrhages; my physicians said I had congestion of the lungs (?), I became very weak and did not recover strength for several months; this was in Aug., 1872. As soon as I was able, I went down to St. Louis and was examined and commenced treatment. At the time I placed myself under treatment I suffered severe pains in the chest, under my shoulder blades, especially, under the left, and sometimes in my left side; the sensation in my throat was simply horrible; I sometimes felt as if my mouth was filled with coals of fire; at other times, there would be a choking feeling, as if something came up like a stick or bar across my throat and almost closed it; then again, I would have such a distressing, continual tickling, and this sensation is the most annoying of all of the ills of the throat trouble. After using treatment for several months, I was very much benefitted, and might possibly have remained so had I not, on going a short distance from home, about last of June, 1873, been caught in a storm, and although I did not get wet, the carriage was damp and the night air also. Two days after this I had a severe hemorrhage, and this so weakened me that it was thought advisable, indeed, it seemed my only chance of recov-

ery, that I should try another climate, and as soon as I was able to sit up my husband took me out to Denver, Col., July, 15, 1873. The first night I did not rest well in the sleeping car; all the next day we stopped over in Kansas City; here, for the first time in weeks, I began to take some interest in things around me; the next day I rested well, and next day was in the beautiful and to me the dear City of Denver. On arriving, I was tired, and noticed the difference in the atmosphere, it being so much lighter; had to lie down most of the day; the second day, walked with my husband about two blocks from the hotel; I remember meeting a sehool girl friend, who had married, and was living in Denver; she afterwards told me, that on seeing me so reduced and looking so like a walking ghost, she was so shocked that she could scarcely control her feelings; we soon secured board at a private house, and at first had to walk a short distance for our meals. I found this little extra walk gave me strength, and I began to walk further every day, until I could walk two or three miles without very great fatigue.

"Although I gained strength and health, I did not gain but few pounds in weight, neither did all my distressed and my ugly feelings in my throat and chest leave me. I often had pains in the chest, head and sides, but not nearly so frequent or severe as in Illi-

nois.

"At first I would have about one nervous sick headache, to where I had four at home, the longer I remained, and the more I lived out in the open air, the less seldom I had an attack. I took the spray of pinus cand. comp. treatment out with me, and whenever my throat was troublesome, in fact, at first, I used it about twice a week. I was in Colorado sixteen months, and had but one very slight hemorrhage of the throat.

"Whenever I have an attack with my throat, especially if I raise blood, it always has a depressing effect upon me, although I fight against it; I want to go off alone, sometimes I dislike persons even to speak

to me."

Even a causual view of the pharyngo-nasal cavity of this patient was sufficient to account for the liaabilty to homorrhage of the throat. Taking all the symptoms into consideration, no doubt can be entertained as to the locality of the ruptured vessel. On the morning of the first hemorrhage, she felt more than commonly well, and had been busying herself more than usual with her household duties. There is no symptoms here to indicate congestion of her lungs. The shock, on being told that she had a fatal attack of lung disease, not the teacupful of blood and saliva, made her weak. She was stricken with fear. The blood vessels in her pharynx and pharyngo-nasal cavities were two and three times the usual diameter of those seen in a chronically inflammed pharynx and pharyngo-nasal cavity. Although she has not stated so in her history, yet her throat symptoms were instantly relieved by the hemorrhage. All that affected her then was the shock from fright. As she recovered from the use of the spray of pinus canadensis and carbolic acid, combined with tonics taken internally, she became less careful, and went to a funeral, at which time she was caught in a storm, being out in the damp night air. On this occasion she caught cold, which produced another excessive congestion in the inflamed pharvngo-nasal cavity; this in return caused another hemorrhage and another fright. Although the amount of blood spat out of her mouth was hardly a tablespoonful, yet the weakness that followed was equal to the loss of three quarts, as seen from her history. At once she was started for Colorado.

I believe it to be entirely proper for me to give my opinion of the cause of this fright, even if I should offend some physician who had the case previous to her coming under my notice. She labored under the impression that she had hemorrhage of the lungs, although she knew that the blood left her mouth without coughing, on leaning forward; but her physician had prophesied that she would have another hemorrhage, and she did, and she was lead to understand that she could not live long.

After her return from Colorado she was under treatment off and on for several years. Since 1876, the course laid out on page 251 was followed, with the result of the abatement of all prominent symptoms. She now weighs more than she ever did in her life. Careful examination of her lungs showed that they had not been the least affected.

CHAPTER XXXIII.

REPORTS OF CASES CONTINUED.

PATIENTS SUFFERING MOSTLY FROM DISEASES OF THE EARS, BUT HAVE DISEASE OF THE NASAL CAVITIES ALSO.

CASE XLVIII.—October, 1877. Miss G., æt. 19 years; light hair; so small in statue that she appears stunted in growth. She was quite deaf, and spoke in so low a tone, and so indistinct as to be hardly understood. It was with great difficulty that I could make her understand me sufficiently to make an examination. She had been deaf nearly all her life; was excessively stubborn, and very peevish; sometimes she would not speak a word to any of the family for days, and always answered in monotones.

I was fully half an hour in making an examination. Partly because she was afraid and partly on account of stubbornness. Both of her tonsils were much enlarged; the pharvnx was in a puffy condition and coated with a stream of fœtid purulent secretion, the origin of which seemed to start from the bassilar portion of the sphenoid bone. I could not at this time get a view of the posterior nasal openings. Inspection into the anterior noses showed that the turbinated processes were so much enlarged as to almost fill the passages. She heard the watch when pressed slightly to her ears. When spoken to at the distance of two feet, she could, if giving attention and watching the lips, give a correct answer to a question; but if the speakers lips were covered, she heard the heard the words, but did not understand what was said.

After kindly persisting for half an hour, I was enabled to complete the cleansing of the pharyngonasal cavity, using plain vaseline; afterwards I used the prescription given on page 251. Inflation, while she swallowed a little water, increased the hearing to $\frac{1}{16}$ with the right ear, and slight contact with the left ear.

To show the difficulty in getting an unbiased history from such a patient, that is answers to questions in which the question did not give a clue to the answer expected, I will give the following conversation that occurred between her and myself on the occasion of her fourth visit:

How did you feel after the last treatment?

"Like I always feel."

I want to know how you always feel.

"Like I told you yesterday."
I want you to tell me again.
"What shall I tell you?"
How you always feel.

"Oh, I don't know, I have a noise in my head."
What kind of a noise do you hear in your head?
(A shake of the head, was the answer).

What do you complain of most?

" Nothing."

Do you feel entirely well?

(A nod of the head).

Why do you come here to be treated?

"To get well."

To get well of what? "To get well of my ears."

What is the matter with your ears?

"Why, I am deaf."

Do you know what was done for you yesterday? "Yes."

What effect did it have? "Made my nose greasy."

Did it stop it up so that you could not breathe through it?

" No."

What did it do besides making it feel greasy? Now, don't shake your head and act as though you were a girl nine years old, instead of a young lady nineteen years old.

(After a full half minute's silence, she shook her

head).

Her mother said, "Oh yes, you do know; did you not say that you could breathe easier and that your throat was not so dry this morning; and beside, you do not use so many handkerchiefs."

"I didn't know that he wanted to know all that?"

After repeated attempts at inflation of the middle ear by the phonation of "hick," it was found that the velum was too weak to retain its position firm enough to allow the injected air to pass into the Eustachian tube, the deglutition of water was then resorted to, which was successful in forcing air into the left ear, increasing the hearing distance of the watch from $\frac{1}{160}$ to $\frac{3}{160}$.

What effect did that [the inflation] have on the

ear?

"Don't know."

Did it make you hear any worse?

"Yes."

Well, then, did it make you hear any better?

" Yes."

What do you mean by your first answer, that you did not know the effect on your ear, when now you admit that you do know?

"I didn't know what you wanted."

How did you feel this morning compared with yesterday morning?

"Don't know."

You are a large know-nothing young lady. "Well, I don't know what you want?"

Did you not tell your mother that your threat was not as dry this morning as it was yesterday morning?

"Yes."

Well, why did you not tell me so, when I asked the question? Why can't you study a little?

"It makes my head ache to study."

"I mean that you should think a little before you answer, so that you can give me information concerning your condition."

"It makes my head ache to think."

"Why did you not tell me that when I asked you for your symptoms?"

"I did not know you-how can I tell that you

wanted to know that?"

All other information was drawn out of her by

this method of questioning.

After she was gone, a physician, who was interested in the case, and in the treatment of catarrhal diseases took up the rôle of asking questions, which, as they and the answers may be instructive. I will give in full.

"What should be promised in a case of that kind?"

That the catarrhal secretion can soon be lessened; that the pain in the head and ears will soon be decreased; that the dryness in the throat will be lessened in proportion to the decrease in the swelling in the nasal passages, which should take place in eight or ten days, with a patient of her age and color of hair; that the hearing will slowly be increased as the secretion in the pharyngo-nasal cavity decreases, which will commence in a few days after the commencement of the thorough treatment; that the mopish, dumpish way should be displaced with the decrease of the inflammation; that the decrease of this inflammation will take place in proportion to the regularity of the treatment, and to the care that she takes of herself to avoid taking colds.

"Then you give all the promises on conditions, that

she may not be able to fulfill."

If she does not comply with the conditions, she does not place herself in the position to recover.

"You mean in the condition for you to cure her."
No Sir! I mean recover, and that, only in part, as her hearing, which has been, for four months at least, nearly as poor as it is at present, cannot be expected to recover more than eight or nine inches of a watch that she should hear 96 inches.

"That is not much encouragement."

I think it is a good deal of encouragement. Even to tell her that her hearing may be with some certainty, maintained at its present acuteness, is sufficient encouragement to commence a very long course of treatment.

"But that she may get this benefit, she is to rely on herself, for if she takes cold the whole treatment will

be for naught."

"What else can I say. We know that colds were the cause of her trouble, we know that a continuation of colds will continue her trouble; you also know that I cannot control her actions every moment of time, day and night. The successful treatment of chronic catarrh of the superior portion of the respiratory tract is like the successful suspension of a chain. If any one link breaks, the chain drops. So it is with the treatment of catarrh. You may say, that the chain is composed of three links, and name the links: Hygienic, Sanative and Therapeutic Measures; if any of the links are broken, the chain is broken, and your attempt to bring about her recovery through these means is unsuccessfull, whether it be your own or your patient's fault.

The patient was treated for six weeks. The hearing was increased to $\frac{16}{96}$ in the right ear and $\frac{10}{96}$ in the left ear. The tinnitus was lessened, the prominent symptoms, objective and subjective, were greatly decreased. Had she been treated six months, which would be a comparatively short time, she would, in all probability, be greatly and permanently benefitted. As it was, the treatment could only have a transitory

effect.

A Patient who had Cough occasioned by Disease of the Ear.

CASE XLIX.—Mr. B., merchant from Mississippi, at 48 years, consulted me in April, 1876, for recurring deafness. He had been liable to take cold since he was a boy, and has had running from his left ear, ever since he can remember anything. During the

last three months he has been troubled by a cough which caused him to fear that his lungs were affected. He had noticed that his cough was much increased at those times that he syringed his ear, especially if he used water that was a little cold. The effect was always so sudden and so lasting, that he thought that the water run into his throat, and down into the larynx. Sometimes he would lose his voice entirely for one or two minutes; at such times he felt as though he would be compelled to clear his throat by "heming" continuously, for ten or fifteen minutes' time, to prevent being choked. He also found that if he pulled his ear, as he some times did, because of an itching sensation within it, he would feel the same choking sensation, and experience the same loss of voice.

His health had been poor for several months past, and he had lost flesh quite rapidly. His appetite was poor, his bowels constipated, and his kidneys did not perform their functions properly, as his urine was very thick and white; sometimes a red sediment was left in the vessel after the urine was thrown out. He had pain in the back, in the lungs and also in the left arm, but this, he thought, came from lying on it in bed. As his little finger and the one next to it had a sleepy, limber feeling in it most of the time, I think that he is mistaken.

The examination by means of the pharyngeal mirror, revealed an excessive inflammation of the pharyngo nasal cavity, pharynx and larynx; both nasal cavities showed the same condition, even the skin in the nose was reddened by the large number of enlarged blood vessels on it.

Constitutional treatment was prescribed, which consisted of a tonic, a laxative and a diuretic. I also advised the use of cod liver oil. The local treatment consisted of the application of vaseline ½ drachm and two drops of pinus canad. comp. by means of the spray producers Nos. 3, 4 and 5 and vaseline alone by the No. '2. These were repeated every day for three

days, then every other day for three weeks and twice a week for three weeks. He was instructed in the manner of keeping his ear clean. The air douche was given at each visit At the end of this course his cough and all of his prominent symptoms had subsided. He had gained nearly 15 lbs. and felt better in every way.

Patients that have Patency of the Eustachian Tube.

I have made many efforts at getting thin sections of the Eustachian tube, such as are fit to be placed under the microscope, but have failed to get them to show the mucous membrane as plainly as is represented by Prof. Rüdenger in Stricker's Histology, pp. 975–977. My efforts have been so far successful as to convince me that he has represented the true condition of this canal. To him the profession are greatly indebted for his scientific researches in this direction.

The Eustachian tube is a very peculiarly shaped canal. The peculiarity of the shape consists in that while it resembles a collapsed tube, whose inner walls are verticle, there is in nearly the whole of its length, along the upper part of the slit formed by the collapsed sides of the tube, a small capillary opening, whose walls are never in contact at any time, and a very short portion (not more than four lines in length) of this upper part of the slit that is slightly and constantly and uniformly in contact. The portion of the tube having the capillary opening in it, is anterior to the short portion that is uniformly open, and resembles a button hole in a dress coat, the sides of the slit or button hole are in apposition, while a portion of one end of the slit is formed into a small opening which remains patent.

The air freely permeates the tube through this small capillary opening, up to the short portion that is uniformly, slightly closed; through this part of the tube, it is drawn into the middle ear and mastoid cells, because of the rarefied condition of the air in these cavities, the mucous membrane lining them absorbing it, which causes the rarefaction. It is thus seen, that it is the inequality of air density that is the cause of the uniform renewal of air in the tympanic cavity and the uniform concavity of the membrana tympani. If such is the fact, how can the Eustachian tube "conduct away the secretion of the cavity of the tympanum," as was said by Roosa, Rüdinger, Foster and Buck. Besides this, the opening into the tympanic extremity of the Eustachian tube is fully two lines above the floor of the middle ear. How then can this tube be used as a means of drainage? Again, there is no proof that mucous membranehealthy of course-in any part of the body secretes more mucus than is essential to its function; therefore as none need to be conducted away from it, no mechinism is required for this purpose. It is as absurd to say that nature provides a drain for a catarrhal middle ear, as it was to say that the function of the uvula was to lead the catarrhal secretions from the post-nasal cavities on the base of the tongue instead of allowing them to drop into the larynx.

Case L.—Miss H——, æt. 22 years, consulted me in March, 1875, for deafness and sore throat, she says: "March 29th, a short time after rising, I experienced a singular and uncomfortable sensation in my throat and ears, appearing to be consequent upon clearing my head. There was a fullness and pressure as if the blood were being pressed upward and outward; the pressure seeming forward of the jugulars and not exactly like a rush of blood to the head. (I under-

stand what that means.) Directly I felt my hearing affected. I swallowed again and again in hope of relieving the trouble but without effect. My first impulse was to force the air into the Eustachian tubes and try their condition, but the sense of pressure, I cannot give it any other name, was such that I feared to try the experiment. Pressing my fingers below and behind the ears gave them temporary relief. The difficulty of hearing continued all day; my head was hot and feverish, even to the outer rims of my ears, and my voice unnatural to me-it appeared to echo in my head-school work part of the time was almost painful. I could detect errors in singing, rather by their producing in the brain a sensation akin to pain than from any other cause, but found myself utterly unable to correct such errors by giving proper pitch because my ear would not tell me the truth. Evening-somewhat better. 30". My head as large, weary and full as yesterday, with, if any difference, increased pressure in my throat accompanied with a feeling of external enlargement, so that I felt a disposition to stroke it downward, as if to remove a swelling. Same trouble in singing-voice very weak. No improvement in hearing-sounds are confused-I am obliged to ask a repetition of what is said to me. For some days I have been annoyed with a constant catarrhal dropping into my throat, the discharge from the nostrils slight."

March 29, 4 p. m.—On examination I found acute inflammation of the pharngo-nasal cavity. The spray from the producers Nos. 4, 5 and 3, as indicated on page 251, was applied very thoroughly. Ten grains of quinine and a laxative was prescribed. The effect of this application was to lessen the heat and fullness in the head. Inflation by Gruber's method was then practiced; this had to be done very carefuly as the membranes of both ears were very sensitive.

This course was followed for about three weeks. In four days all disagreeable symptoms had disappeared. The constant current of electricity was

employed toward the close of the course.

CASE LI.-Mrs. W. K., æt. 36 years, consulted me in March, 1876. "I have experienced peculiar and disagreeable sensations in my ears six or eight different times, either when I had a cold or while taking cold, which I can hardly describe; at such times I could not tell in what tone of voice I was speaking, and the voices of others sounded as though they were speaking in a cistern or a large vacant room. I could relieve the uncomfortable sensation for a short time by closing my nostrils and then breathing as though I were drawing my breath through them, or by certain movements of the under jaw, which would seem to open (or close) some little valve, and for awhile I would feel better, but breathing or speaking would shortly bring it back. These attacks have never lasted long, and it has now been nearly a year since I was last troubled in that way."

CASE LII .- Dr. Chas. L., a very well informed dentist of Kansas City, Mo. "About February I was taken down with tonsillitis, the inflammation being chiefly confined to the right side. After about eight or ten days the inflammation passed off through the Eustachian tube and out through the middle ear, causing severe pain. There was suppuration and rupture of the tympanum, the suppuration continuing for two or three days. The only relief that I could obtain was by hot water injection into the outer ear; as the inflammation passed out of the ear there was considerable swelling behind the ear over the mastoid cells; gradually the swelling proceeded forward and terminated in erysipelas, which spread all over my face, closing both eyes, and extended all over the scalp, causing a great deal of pain. As the erysipelas passed off I noticed every time I spoke that the sound of my voice seemed to pass out through the right ear. I could hear my breath in the ear; I was slightly deaf in that ear; there was a feeling of openness in the Eustachian tube; every breath I took, every sound I made seemed reflected to that ear; although it caused no pain it was exceedingly disagreeable, more annoying than even pain would have been; it was several days before I found any means of relief;

I found that by turning my head over to the right as far as possible and then swallowing that it seemed to close the tube, and I obtained relief till I swallowed again, which immediately opened the tube and noises commenced again; also that by holding my nose and swallowing I obtained relief until the next full swallow; these methods were the only modes of relief; I occasionally syringed my ear out with a warm solution of salt and water, and within two weeks after the rupture of the tympanum it was completely healed; I commenced treatment under Dr. Rumbold about a week after I noticed the noises in the ear; after treatment for about ten days almost all the trouble had ceased; in the commencement of the trouble, by holding my nose and blowing, the Eustachian tube in the right ear was opened by the slightest breath, showing that there must have been enlargement of the tube; swallowing, yawning, blowing my nose, even slightly, opened the tube and caused a cracking, popping sound which was relieved by turning my head to the right side and swallowing. The only relief obtained from turning my head to the right side was that it allowed the mucus engorgement in the tube to run out in the middle ear, where it was absorbed. I had no pain after the noises of the ear commenced; these noises sounded as if my head was in a closed box, causing an echo or reverberation in the right ear, the two sounds being almost at the same time, one so slightly ahead of the other as only to be able to distinguish that there were two sounds. Stopping up the outer ear and blowing my nose did not cause opening of the tube."

INDEX.

Abno	rmally o	pen Eust	achian t	ube	281
Absce	ess of th	he frontal	sinus	*************	259
-	44	antrum	of High	more	260
"	nas	d			384
64	phar	yngo-nasal			385
40	phar	yngeal			385
Acou-	-otoscop	e			206
Air de	ensity in	the midd	le ear	27	2, 275, 307
Air in	the no	rmal tymp	anic cav	rity	275, 307
Air-su	apply to	the midd	le ear	27	2, 275, 307
Allen	Dr. Pe	ter		*********************	327
Amer	ican La	ryngologic	al Asso	ciation	381
Anter	ior nasa	al mirror		minimum union	172
Apho	nia				267
Appe	arance o	f the voca	cords	in chronic inflamma	tion. 268
Appli	cation o	f the spray	y in chr	onic Laryngitis	269
(Prizz)				e nasal cavities	
Arm,				atarrh	
				240, 24	
Asthn	na	******		1911 State in Community	404
Autor	hony				294
Aural	growth	s, removal	of	# 1417 MP 1 21151	379
**					
Aural				ethod and suggestion	
m	aking e	xamination	and ar	plications to	203
Azyge	os prom	inence		or market property	360
Balls,	fœtid, f	rom the to	nsils		375
Bone,	caries	of			. 258, 259
Blood	vessels	appearan	ce of at	first visit	246
	46	"	40	fourth visit	
44	46	44	**	tenth visit	253
44		***	**	after the third ye	
tr	eatment				

I found that by turning my head over to the right as far as possible and then swallowing that it seemed to close the tube, and I obtained relief till I swallowed again, which immediately opened the tube and noises commenced again; also that by holding my nose and swallowing I obtained relief until the next full swallow; these methods were the only modes of relief; I occasionally syringed my ear out with a warm solution of salt and water, and within two weeks after the rupture of the tympanum it was completely healed; I commenced treatment under Dr. Rumbold about a week after I noticed the noises in the ear; after treatment for about ten days almost all the trouble had ceased; in the commencement of the trouble, by holding my nose and blowing, the Eustachian tube in the right ear was opened by the slightest breath, showing that there must have been enlargement of the tube; swallowing, yawning, blowing my nose, even slightly, opened the tube and caused a cracking, popping sound which was relieved by turning my head to the right side and swallowing. The only relief obtained from turning my head to the right side was that it allowed the mucus engorgement in the tube to run out in the middle ear, where it was absorbed. I had no pain after the noises of the ear commenced; these noises sounded as if my head was in a closed box, causing an echo or reverberation in the right ear, the two sounds being almost at the same time, one so slightly ahead of the other as only to be able to distinguish that there were two sounds. Stopping up the outer ear and blowing my nose did not cause opening of the tube."

INDEX.

Abno	rmally o	pen Eust	achian t	ube	. 281
Absce	ss of th	e frontal	sinus	•••••	. 259
66	"	antrum	of High	more	. 260
u	nasa	1			. 3 84
"	phary	ngo-nasa	1		. 385
60	phar	ngeal			. 385
Acou-	otoscop	e	••••		206
Air de	ensity in	the midd	lle ear	272, 275	5, 307
Air in	the nor	mal tymj	panic cav	rity 276	5, 3 07
Air-su	ipply to	the midd	lle ear	272, 278	5, 307
Allen,	Dr. Pe	ter		······································	. 327
Amer	ican Lar	yngologi	cal Asso	ociation	. 381
Anter	ior nasa	l mirror.		·	. 172
▲ phoi	nia	••••••	· · · · · · · · · · · · · · · · · · ·	·	. 267
Appea	arance o	f the voca	al cords	in chronic inflammatior.	. 268
Appli	cation o	f the spra	y in chr	onic Laryngitis	. 269
	46 (to th	e nasal cavities	. 195
Arm,	paralysi	s agitans	due to c	atarrh244	i, 249
"	pain in	caused by	catarrh		5, 435
Asthn	na				. 404
Autor	hony				. 294
Aural	growth	s, remova	l of		. 379
46	polypi	•••••	• • • • • • • • • • • • • • • • • • • •	·····	. 382
Aural	passage	s, instrun	nents, m	ethod and suggestions fo	r
m	aking ex	caminatio	n and ar	plications to	. 203
Azygo	s prom	inence	•••••	- •••••••••	. 360
Balls,	fœtid, f	rom the to	nsile		. 375
				258	
Blood	vessels,	appearan	ce of at	first visit	. 246
.,	"	"	60	fourth visit	. 253
44	44	44	a	tenth visit	. 253
44	46	44	46	after the third year o	
tan	estment				

Brunner, Dr. G 285, 29	3, 304
Calcareous accretions in nasal cavities	386
Caries bone	258
Cause of concavity of membrana tympani 27:	2, 289
Cerumen, inspissated	346
Christopher, Prof. Hiram	. 274
Chronic catarrhal inflammation of pharynx and larynx 26	2, 263
" of Eustachian tube 33	8, 342
" of middle ear 33	9, 342
Chronic catarrhal inflammation of the mucous membran	е
of the nasal and pharyngo-nasal cavities	. 237
Cohen, Dr. J. Solis	. 200
Coloring matter in sputa	264
Conclusions, seven, on the Eustachian tube, etc	275
Conclusion, first, résumé of	. 330
" second "	332
" third "	332
" fourth "	335
" fifth "	336
" sixth "	. 336
" seventh "	336
Constitutional treatment	256
Cysts of the tonsils	. 374
Deglutition in opening the Eustachian tube	. 275
Despondency due to catarrh	. 249
Dirty colored sputa	. 264
Dyspepsia, case of	. 434
Ear injector	347
Ear, paralysis agitans of the muscles of	. 249
Elevator palati muscle	357
" uvulæ "	357
Epistaxis	388
Eustachian catheter. popularity of	
" soft rubber	. 213
" tube inflation of	213

of the larynx, chronic...... 262, 263

44

INDEX.

Inflation of the middle ear 210, 342	
Inhalers	
Instruments for making examinations and applica-	
tions 169, 182, 203	
Inspissated cerumen	
Incision of the uvula	
Iodide of potassium 258	
Irritability, due to catarrh 249	
Jago, Dr	
Jarvis, Dr. of New York City 381	
Judd, Dr. Homer	
Keller, Dr. J. M. 260	
Krammer bi-valve speculum 359	
Laryngeal forceps, tubular	
Laryngitis chronic, not idiopathic 289	
Larynx, chronic inflammation of 262, 263	
" growths in 394	
Leffingwell, Dr. H. S	
Leslie, A. M. & Co., of St. Louis 200, 282	
Local applications 250	
Management of patients 227	
" adults 228	
' children 234	
Maunder's spray producers 200	
Mastoid cells functions of	
McDowell, Dr. Drake 260	
Membrana tympani cause of concavity 272, 289, 307	
" rupture diagnosed by tuning fork 343	
" " perforating the 396	
" eyelet in 397	
Mental symptoms of catarrh	
" derangement, fear of 249	
Method of air-supply to the middle ear 272, 289, 307	
" Dr. A. Politzer's 215	
" Dr. Gruber's 220	

464

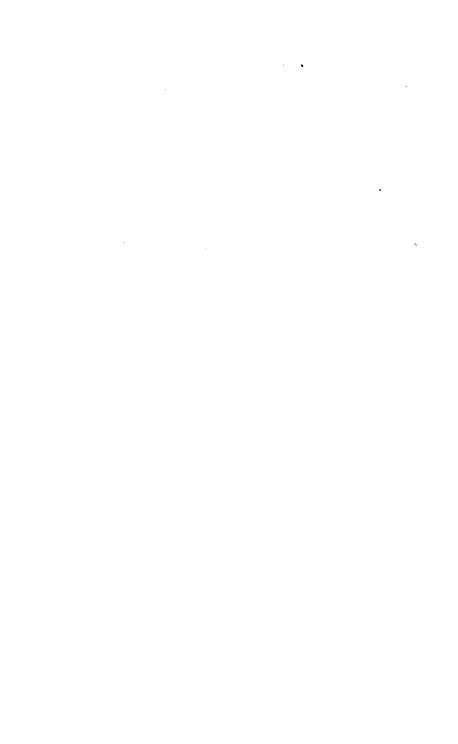
Patients who had severe cough from a foreign body in	
the nose	412
" who had hay or autumnal catarrh	413
" who were despondent, irritable, etc	414
" who had pain in the eyes	
" whose principal symptoms was dyspepsia and	
sleepleasness	
" suffering mostly from disease of the larynx, but	
have disease of the nasal passages also	437
" troubled with harrassing cough	439
" who had pain in the throat and chest and had	7-
hemorrhage from the throat (and lungs?)	442
" suffering mostly from disease of the ears but	
have disease of the nasal cavities also	446
" who had a cough occasioned by disease of the	
ear	450
" that had patency of the Eustachian tube	452
Perforating the membrana tympani	396
Pharyngeal mirror	174
Pharyngitis, chronic follicular	262
Pharyngo-nasal catarrh	237
44 abscesses of cavity	385
stenosis of "	387
" cavity, catarrhal inflammation of	237
Pharynx, chronic inflammation of	262
Pinus canadensis comp	251
Politzer, Dr. Adam, of Vienna 215, 272	396
Polypi, aural	381
Polypus forceps	380
Position while inflating the middle ear	216
" of patient and physician	227
Prescription for chronic laryngitis	270
" " nasal catarrh	
Prince, Dr. David	
Probang	187

St. Louis Medical Society	ĺ
Stricker's Manual of histology 273	
Subjective symptoms of catarrh 241	ı
Successful treatment of chronic catarrhal inflammation 410	į
Suffocative sensations	
Suggestions for making examinations and applications 169,203	į
Syphilitic cases	3
Syringe 190	
Swab 187	
Table, operating	
Tenotomy of tensor tympani	
Therapeutic and operative measures 169	,
Tickling sensations not in the larynx 266	3
Tinnitis aurium,	
" a paralysis agitans 351	
" case of 352, 353	
" treatment o 354	į
Tongue depressor 175	
Tonsils, excision of	
" cysts in	
" fœtid balls in 375	
Toynbee, Mr 217, 272, 274, 281, 289, 312, 326	3
Treatment, local of catarrh	,
" " ozæna 257	
Tröltsch, Dr	
Tube, Eustachian, functions of	ı
" for inflating the middle ear	,
Tubular laryngeal forceps	
Tumor of the uvula	i
Tuning fork as a means of diagnosis 343	į
Tympanum, inflation of 210	
Uniform supply of air to the middle ear	-
" concavity of the membrana tympani 272, 313	
Uvula, functions of	
" excision and incision	

Index. 46	37
Uvula, œdema of	76
" tumor of	79
" retractor 1'	77
Valsalvian method of inflating the middle ear 2	11
· Vertigo, case of 4	32
Voice in chronic laryngitis 2	65
" how to use it in chronic laryngitis 2	71
Warm spray producer 2	05
Williams, Dr. A. D 2	72
Yearsley's artificial tympanums 3	27

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